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The Bedford Scheme.

THE proposed electrification scheme for Bedfordshire is the subject of a memorandum issued last week by the Electricity Commissioners which is summarised in this issue. The scheme may be regarded as a manifestation by the last Government of its real interest in making electricity available for the countryside, and there is reason to suppose that the present Minister of Transport regards this legacy from his predecessor with some favour. The area seems to have been well chosen as representative of average conditions obtaining in rural districts in other parts of the country. Thus, it is situated not very far from a large town, whence energy can be transmitted at what is now generally agreed to be the most satisfactory intermediate, or high-voltage distribution, pressure of 11 kV; the population per mile is the average obtaining in rural areas in England and Wales; local supplies already exist in some of the townships, giving a nucleus load; and there is the usual assortment of village industries to provide a power load to help to meet the standing charges.

An interesting technical feature is the intended use of cadmium copper and galvanised steel conductors. The transmission system is to be completed within two years. The gross annual revenue is based upon an average rate of 2.4d. per kWh at the end of six years, and, as the inclusive capital charges on the rural system plus bulk supply charges at the same period amount to less than 1.75d., the margin for contingencies after making allowance for the cost of operation and maintenance should be wide enough to meet unforeseen contingencies, such as the enforced use of underground cable in a few instances.

The revenue is estimated on the assumption that 700 kWh per annum per consumer will be supplied, and that 75 per cent. of the population will use electricity. Although this may seem on present experience a high figure, we believe that, given the right methods of approaching prospective consumers, it will prove to be conservative. The chief load in rural districts will be found, for the immediate future at any rate, in the kitchen, and, as gas is available in only three of the villages, the field for development is large. The nature of the facilities to be offered in the shape of assisted wiring and hire or hire-purchase of apparatus has not yet been determined. The anticipation of a consumption of

700 kWh per consumer leads us to suppose that such facilities will be comparable at least with those offered by the most progressive undertakings.

The Bedfordshire scheme will, in fact, be looked to not only for information and statistics, but also as an example to all electricity supply authorities whose duty or enterprise leads them to develop intensively the rural parts of their areas.

The Electrical Industry.

The failure of all of our Governments—conducted along party lines—to effectively deal with the great unemployment problem of these industrial islands is occasioning widespread impatience. One wonders what are the probabilities of our dealing with it at a more rapid rate by accentuating the party spirit amongst us. That it is a national question, a British one, in which all members of the great family at home and overseas have a direct interest and an unevadable responsibility, we have remarked again and again.

Present indications suggest that we are to be involved as a people in further party controversy which may well lead us temporarily from bad to worse, for controversy in the political world neither re-inspires financial and industrial confidence nor brings the orders that we need. Nor can we expect the situation to be improved by a Government which, through one of its Ministers, causes apprehension of the withdrawal of safeguarding and the fear of further taxation burdens, while through another it spreads out schemes which, judging from the unemployment figures, are not improving matters.

Though politics are outside our province as a journal, there are many points of economic bearing which are very definitely within our scope, and some of these are discussed in the following pages this week by Sir Benjamin Longbottom, who, in addition to representing an important branch of British electrical manufacturing in which he has specialised throughout his business life, has a record for energetic activity as a past chairman of the B.E.A.M.A. Council.

He needs no introduction to our readers, and we commend his views on the "Prospects of the British Electrical Industry" to their serious attention, as a contribution to the discussions that are occupying the minds of all who are anxious for the future success of, not only the electrical, but all other great British industries.

The Future of the Fair.

The setting up of a committee to consider a number of points regarding the future of the British Industries Fair has come later in the day than was expected. We looked for it months ago, but we welcome it now that it has arrived, because it promises to deal with matters on a broad basis. We hope, however, that it will lose no time in getting to work, if it is intended that its conclusions shall be made effective in 1931. Such subjects as extending its scope, deciding upon dates, and the desirability of holding a second show in the autumn, should be settled early so that the organisation and other arrangements may be taken in hand in good time. The limitation of participation to manufacturers, and charging higher space rates to exhibitors, so as to raise funds for financing the necessary publicity campaign, are points likely to give rise to controversy, while the holding of sectional fairs abroad and the organisation of travelling fairs in ships and trains are points which, although they have been much discussed in years gone by, may absorb a good deal of time in their consideration now, without helping us to do better either at Olympia or at Castle Bromwich. But we have no desire to be querulous; any promising innovations overseas merit careful attention. Most of all we want the Fair to become bigger and bigger, and better and better every year, because we think it helps to bring orders and thus makes more work for our kith and kin. We therefore wish the committee success, and hope that before many suns have set we shall hear that willing minds are concentrated on the task, making up for the time lost in appointing it.

Since the above words were written, the prospectus of the Birmingham Section for 1931 has been issued to exhibitors, the date arranged being February 16th to 27th.

Engineering Museum for Newcastle.

It is curious that a town so much a part of engineering history as Newcastle-on-Tyne should have no permanent record of its achievements, such as only a public museum can contain.

The interest and instruction obtainable from the South Kensington museum, and its undoubted popularity, would appear to indicate an even greater success for a similar institution among people who have inherited an environment of engineering. One may observe in parenthesis that many of the exhibits in the London museum owe their origin to the north-east coast.

The movement now on foot on Tyne-side to establish an engineering museum is worthy of the support for which the North-East Coast Institution of Engineers and Shipbuilders now appeals.

The progressive attitude of the Institution is shown in its view that the museum should eventually contain not only a record of the discoveries, inventions, and developments standing to the credit of the locality in the past, but also that its contents should indicate what is being done now and even of what is projected.

Skilled Labour in England and France.

It is peculiar that the conditions affecting skilled labour and the supply of competent workmen have lately become more unfavourable both in England and in France. In these relative conditions, however, there exists a difference of vast importance, for they follow an inverse ratio. As the question of how to find employment for our workmen increases in its gravity here, so does the shortage of available workmen in France become more insistent; indeed the difficulty of finding sufficient trained labour to meet the requirements of French industries, particularly the heavy industries, is regarded in many quarters as a menace which in the not far distant future must necessarily dwarf commercial development. Even to an individual who is acquainted with the industrial conditions of both countries this state of affairs is as extraordinary as it is inexplicable. Theories may be advanced with ease—political, economic, tariffs, cost of living and cost of labour, population, national wealth, national tastes, characteristics, habits, thrift, and so on. The explanation would probably be found to lie in a combination of many causes, all leading to the same end. What is certain is that this difference, so amazing in two countries placed geographically so close to one another, and touching so intimately the very hearts of the nations, actually exists to-day. If any doubt were possible on this point it would be dissipated so far as France is concerned by the surreptitious importation of labour into France from foreign countries which has recently developed an activity in the nature of a trade, since the agents draw an illicit commission. In one case during February, at Marseilles, one batch of workmen, more than 100 in number, were introduced into France from Greece without their having observed any of the French immigration regulations. All these men were at once absorbed willingly into French industries, notwithstanding that the employers have rendered themselves liable to fines up to Fr. 1,000 for each foreigner thus illegally engaged. The authorities are continuing their investigations, and prosecutions are imminent.

Prospects of the Electrical Industry.

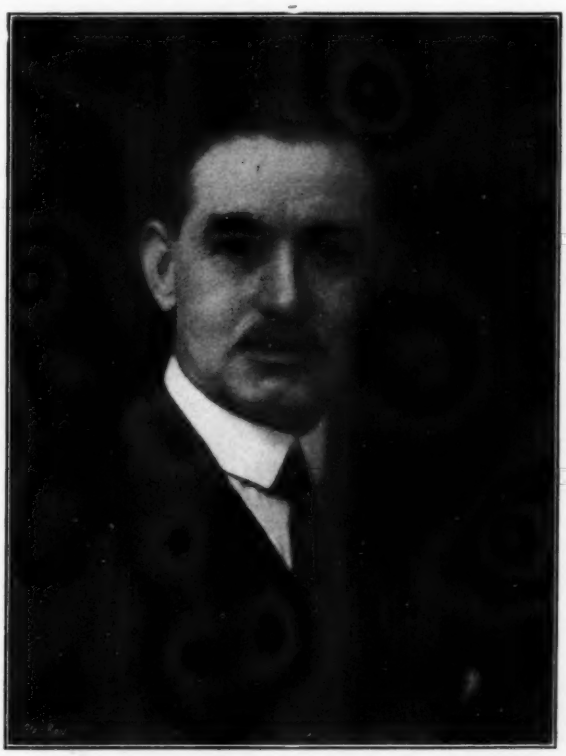
Economic Outlook, Empire Development, Protection, Rationalisation and Co-operation.

By SIR BENJAMIN LONGBOTTOM.

FOR a number of years industrialists in this country have been told that a revival of trade was imminent, and influenced by those opinions they have just been able to carry on; but it is already becoming apparent that trade, instead of reviving, is actually declining. It would be difficult to find, internationally, a more complicated and, on the whole, more depressing state of affairs than at present exists, and I am inclined to believe that the present critical situation has been caused by a number of economic factors which were ignored by our financial and economic experts in making their forecast of trade tendencies.

The slump in the New York Stock Exchange which was preceded by prolonged depression in the leading stock exchanges of the world; the collapse in commodity prices and with it the economic disorganisation of many important markets, especially in South America and in the Far East; the rapid fall in the price of silver and with it the purchasing capacity of the Chinese and Indian peoples; the political difficulties in India itself and the agitation for independence which has been going on in a number of the Dominions—all these complications have not occurred merely by chance; they have been due, I feel, to an insufficient appreciation of the international effects of definite political and financial policies on the part of the leading industrial countries.

The adoption of the gold standard, without any real consideration of its effects on the social and political and economic structure of the world market, is only one example of this tendency to impose theories on international trade without consideration of factors which may render them dangerous in the extreme.



F. W. Schmidt [*Manchester.*

Sir Benjamin Longbottom.

It is at this point that one should devote attention to the fiscal and financial policy which has dominated this country during the last hundred years and has been adhered to by successive administrations without change. We have had imposed on us the theory of Free Trade which, internationally surveyed and adopted, might have perfect economic justification, but adopted by one country alone simply means the victimisation of that country.

We have had also imposed on industry a theoretical gold standard which, in actual practice, has ceased to operate effectively and has been a factor not only in reducing the purchasing capacity of the British people as a whole, but in upsetting fundamental trade conditions in some of the largest markets to which we send our exports.

The third theory which is now being advanced with great enthusiasm is that of rationalisation, but I am afraid that this is another perfect doctrine whose adoption is not calculated in itself alone to improve the industrial situation and bring British industry out of the depression in which it is lying at the present time

In other words, the practical needs of industry have been ignored in the desire to realise certain theoretical principles which may be perfect in the text-book, but applied to the complicated world of trade can only result in making confusion greater still, and in interfering with those minute processes of adjustment which make for international trade and industrial prosperity.

I believe that the time has come when this country must survey its position with reference to other countries, and through a more practical realisation of the needs of industry evolve a national policy, both fiscal and financial. The last few years especially have demonstrated that Free Trade does not bring with it the prosperity which its advocates have always put forward as its main justification; on the other hand, it has intensified depression and increased unemployment. It has robbed industry of profits necessary to re-equipment and re-organisation; it has reduced the capital value of our productive assets through the fact that they cannot be profitably employed; and it has failed signally to cheapen the price of raw materials and the cost of living. Capital and Labour suffer alike from this system. A tariff should be imposed on all manufactured goods which are in competition with British products.

Again, there should be some more effective correlation between our financial resources and national and imperial economic development. It should not be possible for large schemes to be held up in the Dominions and this country merely because sufficient capital is lacking, when we can finance our competitors in Europe and supply the money for the development of public utilities abroad which have not placed a single order with manufacturers in this country. We cannot afford now to finance the industrial and economic development of all the world without reference to our own industrial and trade requirements.

Again, some effort should be made to survey exactly all possibilities of more effective and equitable co-operation between Great Britain and the Dominions, especially in the development of essential industries. There is, of course, a danger that, in the desire to evolve a large manufacturing organisation at once, the Dominions may retard that uniform economic development which is necessary to lasting prosperity, and by imposing excessively high tariffs render the cost of equipment excessively high to the home consumer without really encouraging the expansion of home manufacture.

There is, after all, a limit below which production

can scarcely be justified. If the home market for a definite product is so small that large-scale production becomes impossible, then it is definitely unwise to encourage home production. It is surely better to wait until the market has expanded sufficiently to justify the introduction of industries operating at a satisfactory level of efficiency. Such industries would not require the very high tariff protection which is now being demanded in the Dominions.

On the other hand, one must recognise that the Dominions must be something more than purely agricultural centres; they must be encouraged actually to expand their manufacturing resources and to make more effective use of the materials and power within their control. In this encouragement the electrical industry can play a very large part indeed, and its contribution, already very great, can be made more impressive still if the Dominion authorities and British industry evolve a policy of mutual assistance destined to improve economic conditions, and adhere to this policy when the interchange of goods is considered. It is along these lines that the development of the electrical, as well as other, industries in the Dominions may be expected.

The electrical industry is, of course, alive to these possibilities and it is engaged at the present time in investigating ways and means of co-operating with the authorities in the Dominions.

At the present time, the position of the British electrical industry, both at home and overseas, is complicated by a number of factors which were not operating even a few years ago. There is first of all, American penetration into public utilities not only in Great Britain, but in the majority of overseas markets where public utilities are operating outside of the control of public authorities. American activities in this respect have been notable above all in South America and the Far East, but it is a peculiarly significant fact that British electrical exports to these markets have not been affected to any great extent, and will probably not be affected in the future.

Electricity supply is becoming more and more a public function, especially in Great Britain, under national co-ordination and in some cases, national control, so that the purchase of public utilities overseas may have less significance for the development of trade in the future than it has had in the past. One must also recognise the fact that a number of such utilities, even American-owned, have placed orders in this country.

Again, there has been a very rapid movement towards co-operation between electrical manufacturers: such co-operation has taken the ferm of amalgamation of individual concerns into large groups and of close working agreements between the new groups thus formed. A similar movement can be traced in power finance, and, to some extent, also in electricity supply. The countries in which progress has been most marked in these directions are Germany, France and Belgium, quite apart from the United States; and the electrical industry has been held up as an example of rationalisation as carried out in one of the newer industries.

It is true that within limits the formation of large units is justified, but to insist that the future of any industry depends merely on the concentration of production in a small number of producers of a composite nature is merely to ignore economic fact. The small firm—by this I mean the firm employing from five hundred workers or so can concentrate on one range of specialities and can obtain cheaper and better production than the composite concern which has got to co-ordinate an enormous number of ranges of manufacture. It will always be true that the prosperity of an industry is to be found more in a reasonable number of manufacturing concerns, all operating efficiently, than in a very small group of gigantic combines straddling an entire industry.

One example of this truth is to be found in the national electrification scheme by which, in 1940, the entire electrical output of the country will be concentrated in about 106 generating stations, assisted by 24 temporary stations, giving a grand total of 130. When the scheme was first considered it was confidently assumed that only 60 stations would be required and certain authorities stated that 20 stations would serve the purpose, but those responsible for the elaboration of the national scheme have found, by comparing costs and investigating operating conditions, that the necessities of the country would be better served by spreading production over 130 stations as mentioned, than by concentrating output in 20 or 40 stations.

That lesson, I think, can be applied to the manufacturing industry generally. Trade prosperity lies, I feel, in co-operation between producers and the co-ordination of activities through central associations, in much the same way as the national supply of electricity will be co-ordinated through the Central Electricity Board; stabilisation of prices and of conditions of production, and the recognition on the part of the producers themselves and of the nation as a whole, that such stabilisation is essential to economic welfare.

Trustification, which is an extreme form of rationalisation, is not suited to the peculiar conditions of Great Britain, but one must recognise that a large number of concerns in the basic industries do require some measure of rationalisation if they are to become efficient again. It is at this point that the work initiated by the Securities Investment Trust will be of greatest value. Such a trust, which among other activities, will probably work in co-operation with the Central Electricity Board and the Bank of England, will aim at increasing competitive efficiency in industry. As I understand, it will not aim at creating large units actively competing against each other and without any form of co-ordination other than that of financial control, but it will tend to strengthen the position of those trade associations which, like the British Electrical and Allied Manufacturers' Association, are genuinely engaged in developing a joint policy for the industry and in co-ordinating activities with a view to ensuring higher efficiency and more stable price conditions. There is no fundamental antagonism between the ideas which have gone towards the development of the British Electrical and Allied Manufacturers' Association and the growth of rationalisation. Both aim at the same thing; namely, the restoration of prosperity to industry and the development of a solid front against foreign competition both at home and abroad.

As I have already stated, the international economic position at the present moment is highly critical. It has been due above all to the imposition of theories without careful consideration of modifying factors which exist in reality, but there is no reason why the British electrical industry, with its magnificent manufacturing resources, its enlightened and, on the whole successful, public policy and its capacity to co-operate through the central association, should not be able to maintain its position intact and even increase its participation in Dominion and in world trade.

The industry has been fortunate through the fact that it has been in possession for a number of years of all information of an economic nature bearing on its activities, direct and indirect. It has created for itself very strong public prestige. It has used its influence not merely to develop the economic resources of the country, but also to ensure more widespread recognition of the necessity for electrification. A few years ago one might have thought that activities of this kind, bearing on broad economic and even at times political questions, with apparently no connection with electrical manufacture, were not justified, but, in the modern industrial world, no line of demarcation can be drawn between the purely political, the purely financial, the purely economic, and the purely industrial aspects of anything; and some part of the success of the industry in maintaining output at a high standard through a very difficult period has lain in the fact that it has consistently recognised that all activities, entering into the modern industrial state, must, sooner or later have an effect on electrical manufacture which supplies equipment to all industries and enters, directly or indirectly, into all economic activities.

Heavy Engineering Practice.

An Account of Some of the Principal Products of the English Electric Co., Ltd.

(*Concluded from page* 338.)

Before leaving the subject of water-power plant we may refer to the design by the company of high-voltage alternators of an unusual type. Three of them, each of a capacity of 12,350 kVA (m.c.r.), have been supplied to the Perak River Hydro-Electric Co. Owing to the low speed (93.75 r.p.m.) and severe conditions specified, their dimensions are abnormal, the stators having diameters of 25 ft. 6 in. and the rotors of 21 ft. For obtaining satisfactory speed regulation on load, the flywheel effect is 12,500,000 lb.-ft.^{2} and the rotors are designed to withstand an over-speed of 100 per cent.

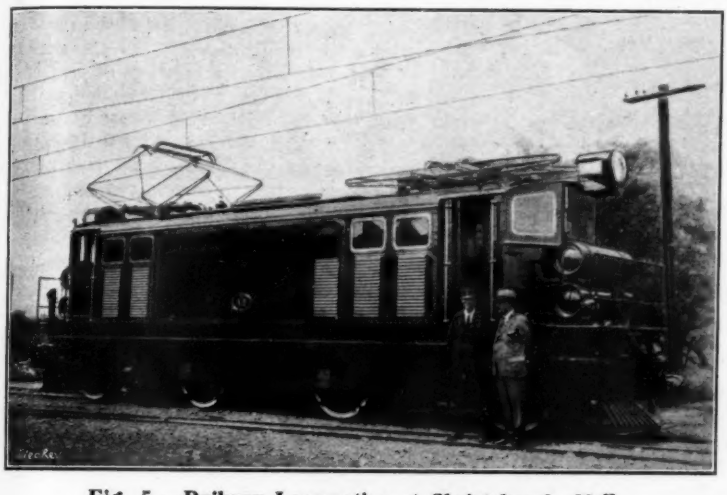


Fig. 5.—Railway Locomotive at Christchurch, N.Z.

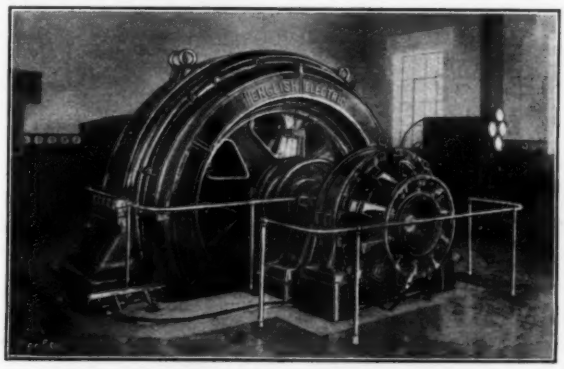


Fig. 6.—2,000-h.p., 6,600-volt, Motor-fan in a Gold Mine.

Two somewhat similar vertical alternators are under construction for the Waitaki power station of the Public Works Department of New Zealand. These will each have an output of 16,666 kVA at 125 r.p.m. The stators, one of which is shown in fig. 8, are 29 ft. in diameter.

Fig. 9 is a view of the two 22,000-b.h.p. vertical reaction turbines built for the Loch Ericht station of the Grampians Electricity Supply Co., Ltd. They are 500-r.p.m. machines designed for a 515 ft. head.

Although the turbine is the most striking product of the Rugby works of the English Electric Co., in some respects the Fullagar opposed-piston internal combustion-engine may be said to be the lineal descendant of the central-valve engine. It embodies a radical departure from previous practice, similar to that found in the famous steam engine, a departure which economic operation has fully justified. A diagrammatic section showing the unusual arrangement of a pair of cylinders is given in fig. 13. Unlike many designs theoretically sound from the thermodynamic aspect, it has proved singularly reliable. The fact that it may be found in several out-of-the-way places of the world, where maintenance is difficult, indicates the confidence placed in its satisfactory operation, and the number of repeat orders received for this type of engine is sufficient confirmation of the regard in which it is held for small plants. Fig. 12 shows the engine-room of a power station in India containing two 750-kW 250-r.p.m. sets. In the background a 275-b.h.p. 214-r.p.m. Diesel engine (also by the English Electric Co.) may be seen. The largest Fullagar engine built is the eight-cylinder, 1,500-b.h.p. engine for Leatherhead, Surrey. The English Electric Co. is the sole manufacturer of the land-type Fullagar engine, and although it builds both Diesel and Fullagar engines, it prefers to put forward the latter for powers of 750 b.h.p. and above, in view of its smaller weight and the smaller floor space required per h.p. This advantage is illustrated in fig. 11 in which a 1,125-b.h.p. Fullagar engine is superposed on a 500-b.h.p. Diesel. While the cylinders of the Fullagar engine stand higher than those of the other, the head-room required for withdrawing the piston and connecting rod is actually less.

High-power switchgear is made at the Stafford works of the company, once known as Siemens Bros.' Dynamo Works. For pressures above 44 kV the standard design has long been of the outdoor type, on

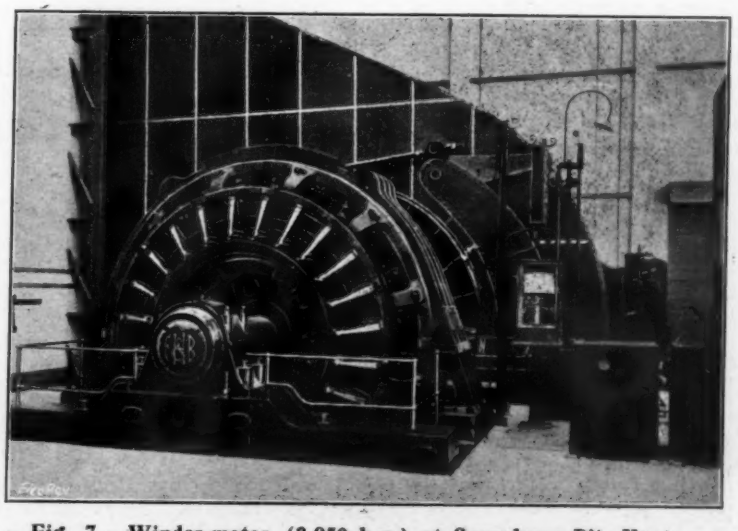


Fig. 7.—Winder-motor (3,950 h.p.) at Snowdown Pit, Kent.

account of the large clearances and headroom necessary, but the trend towards increased cost of buildings for the larger powers now transmitted has led to the development of outdoor sub-stations for much lower voltages.

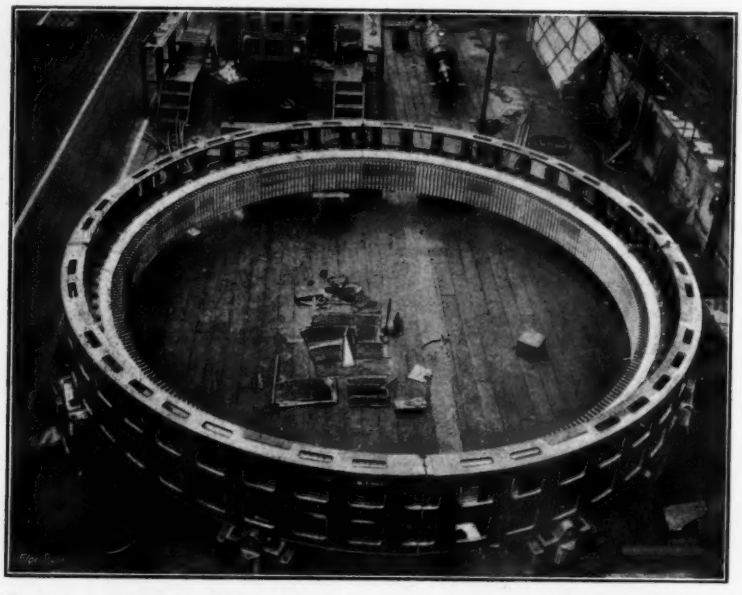


Fig. 8.—A 16,666-kVA Alternator (125 r.p.m.) for New Zealand.

The company is prepared to provide and equip complete sub-stations for any pressure up to 220 kV, and a striking example is given of this field of activity in fig. 14, which illustrates a 110-kV switching centre on the Great Indian Peninsula Railway (ELECTRICAL REVIEW, November 22nd, 1929). Of quite a different type is the example of metal-clad compound-filled switchgear shown in fig. 10, which has been recently erected at the Lodge Lane sub-station of Liverpool Corporation. Compound-filled gear, which is constructed as an alternative to the stone cell-work type, is employed with either plug or oil-switch selectors for rupturing capacities in excess of 250,000 kVA, at and below which figure the air-circulated truck type with plug selectors is generally suitable. Solid compound is normally used for bus-bar chambers and the more permanent connections, and oil or semi-fluid compound for current transformer chambers. Elaborate inter-locking devices, of a kind tactfully described by the company as "mistake-proof," are provided to guard against danger arising out of improper and accidental operation of the gear.

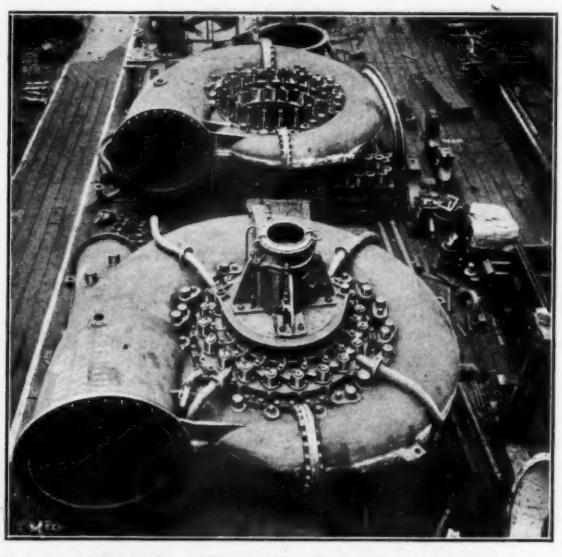


Fig. 9.—22,000 h.p. Water-Turbines for the Grampians.

It is probably true to say that at the present time transformers are the most reliable of all electrical plant, and the English Electric Co. is again well in the van of manufacturers. Transformers of its make are now in operation at Yoker for the Central Electricity Board. They are three-phase, 132-kV, 15,000-kVA units with five-limb cores, a construction which reduces the cross-section of the yokes to about one half of that necessary with the usual three-limb core; a corresponding reduction is effected in the depth of both yokes, making a considerable saving in the overall height of the transformer—a feature which is of the first importance in view of the low loading gauge, as compared with that in other countries, of British railways. The Central Electricity Board has also purchased a number of self-cooled 33-kV transformers from the company for use in South-East England. All the above transformers are fitted with external on-load tap-changing gear, with tappings placed at the centre of the h.v. coils, the range being + or − 10 per cent. in steps of 1.43 per cent. The company is building 45,000-kVA three-phase transformers, but is able to build units up to 100,000 kVA before the necessity arises of employing the alternative arrangement of banks of single-phase transformers.

The subject of sub-station apparatus provides an opportunity for a brief reference to present developments in rotary convertors. The most interesting question at the present time in the design of these machines is that of the maximum voltage for which single-commutator machines can be constructed. The English Electric Co. has constructed many such machines for 1,500 volts, the most recent of which were started up last April on the Nikko line of the Tobu Electric Railway system in Japan.

Fig. 10.—Metal-clad 11-kV Switchboard at Liverpool.

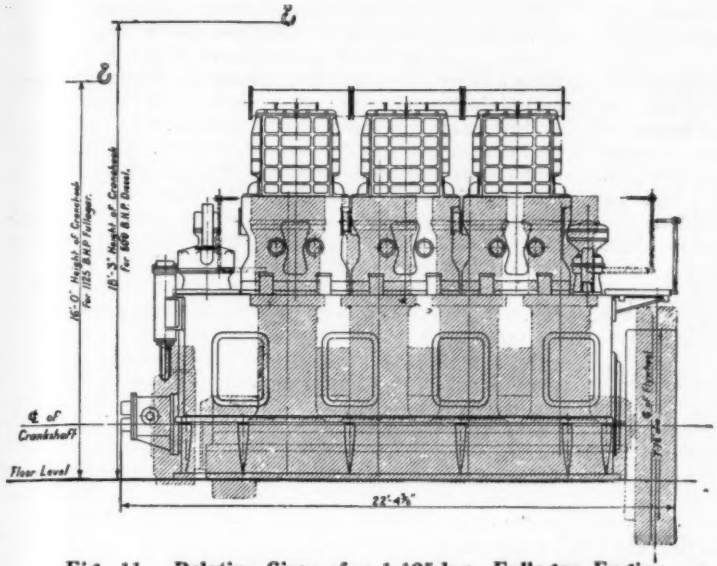


Fig. 11.—Relative Sizes of a 1,125-h.p. Fullagar Engine and a 500-h.p. Diesel Engine.

sea level, being quite unsuitable for heavy traffic. The distance by rail across the Southern Alps is 13 miles, and the journey now takes less than half an hour, including some five miles of tunnel—the longest in the Empire and the seventh longest in the world. The English Electric Co. carried out a comprehensive contract, including a steam-turbine power station. A 1,500-volt d.c. overhead contact system is employed and the line copes with over 47,000 ton-miles per day. The second scheme, for which the New Zealand Government again engaged the English Electric Co. to supply the whole equipment, was the electrification of the seven miles of steam-operated line between Christchurch (Canterbury, South Island) and its main port, Lyttleton. It is now almost exactly twelve months since the inauguration of the new *régime*, and the first year's working has fully justified expectations, minor "tuning-up" troubles having accounted for only one minute's delay per 580 locomotive miles.

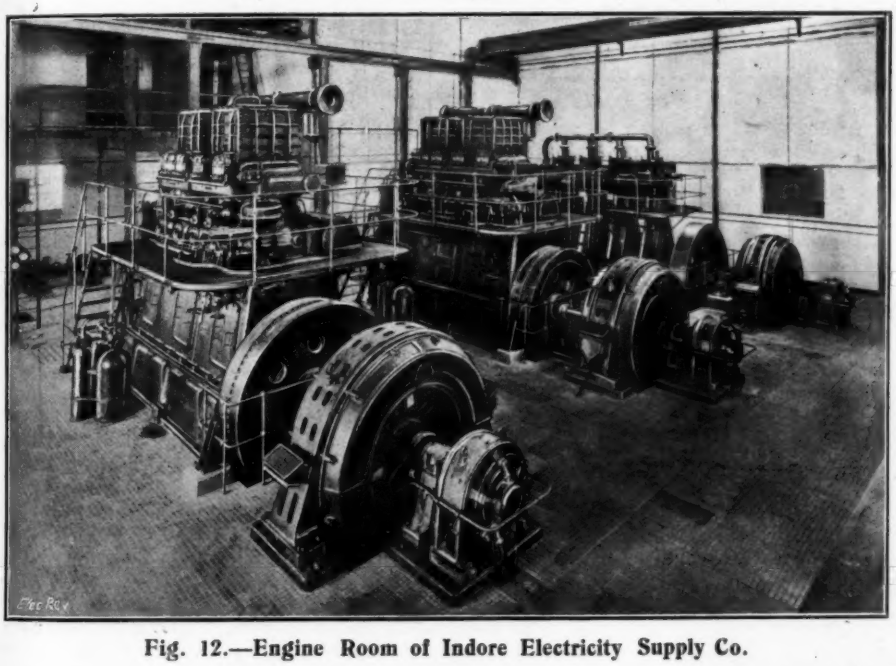


Fig. 12.—Engine Room of Indore Electricity Supply Co.

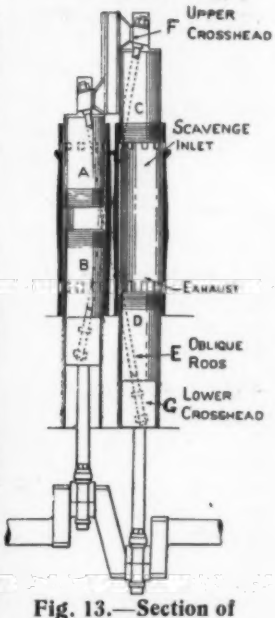


Fig. 13.—Section of Cylinders of Fullagar Engine.

In view of the awaited report of the Weir Committee on main line electrification in this country, traction matters may be regarded as topical just now.

One of the first railways to be electrified in this country was the section between Liverpool and Southport, opened to traffic in 1904. It was the work of Dick, Kerr & Co. Subsequently that firm was responsible for many successful railway electrification schemes, both at home and abroad, and the English Electric Co. has at its disposal all the wealth of experience gained in pioneer work of this character. This experience was put to good use, for instance, in the electrification of two lines for the New Zealand Government. The first of these, the Arthur's Pass section, has been in successful operation for a little more than six years. Prior to this, the only connection for freight between the two provinces of Canterbury and Westland on the South Island was by a sea journey of some 400 miles, the alternative route by road, 3,000 ft. above

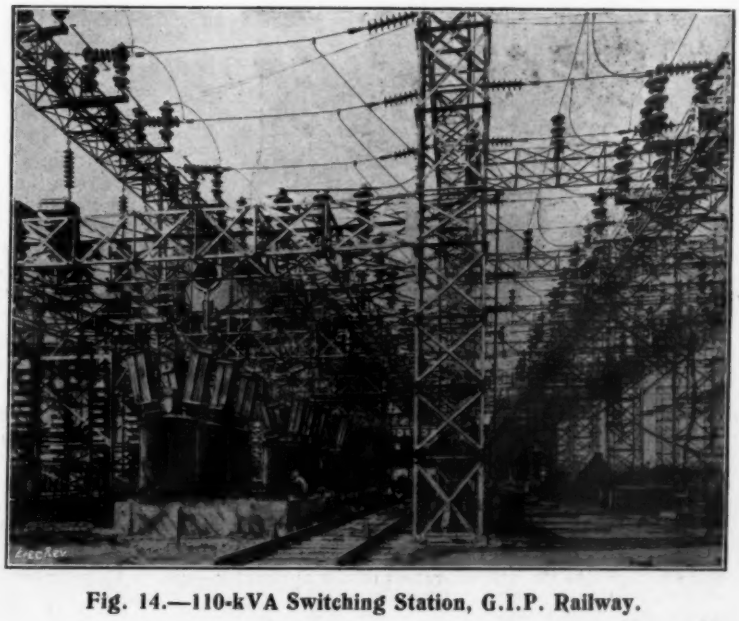


Fig. 14.—110-kVA Switching Station, G.I.P. Railway.

There are six locomotives of the type shown in fig. 5; each of these weighs 50 tons and is equipped with two pairs of 297-h.p., 750-V motors connected permanently in series. Speeds in excess of 40 m.p.h. with trains weighing 600 tons have been obtained.

Diesel-electric traction is still in the early stages of development. The company, however, has executed several orders for equipments, notably one of 500 h.p. for the L.M. & S. Railway and three of 200 h.p. for Spain and Venezuela, respectively. We should like to comment on the railway work of the company in Bombay, Cape Town, Japan, and other places abroad, but it would deserve an article in itself.

One cannot avoid a reference, when dealing with the subject of traction, to the future of electric tramways. Pessimists exist, but these, we think, do not take sufficiently into account the large carrying capacity of tramcars as compared with other public conveyances. In some cases, certainly, their existence has been threatened and even extinguished by more flexible vehicles, but the urban transport load, existing or potential, is of too much importance to the electrical industry to allow the claims of the petrol 'bus to pass unchallenged. The trolley 'bus may be claimed to have all the advantages of the petrol 'bus, with the additional assets of lower maintenance costs, smoother running due to absence of gears, better acceleration, and avoidance of noise and smell. The attitude towards the problem of many municipalities is shown by recent orders received for trolley 'buses, which are manufactured complete at Preston, from the Corporations of Bradford (23), Darlington (6), Nottingham (6), and Maidstone (7).

Concerning heavier industrial plant, there is a good deal that might be said, did space permit. We must content ourselves with a reference to a couple of striking examples of large plant, namely, the 2,000-h.p., 3-phase, 50-cycle, 6,600-volt asynchronous-synchronous motor (166 r.p.m.) driving a ventilating fan at the Randfontein Estate Gold-mining Co. (fig. 6), and the 3,950-h.p. winder at the Snowdown pit of the Kent Collieries (fig. 7). The latter is driven by a direct-current motor operated from a three-phase supply on the Ilgner system.

In a necessarily brief review of the larger machines manufactured by a firm of the varied activities of the English Electric Co., it is unfortunately possible to include no more than a few of the most conspicuous examples of present-day practice as a guide to what is being done at home and abroad by British manufacturers. We cannot here attempt even a reference to many other notable types of plant with which the name of this company is associated.

Our thanks are due to the English Electric Co., Ltd., for permission to reproduce the photographs illustrating this article.

Electricity for the Home.

Notes on selected Electric Cookers exhibited at the British Industries Fair, Birmingham, depicting the trend of modern development.

TO those interested in the development of domestic electrical equipment the display this year at the British Industries Fair at Castle Bromwich should be particularly encouraging. There is ample evidence that the manufacturers are not just marking time. There is ample evidence that in the development of domestic appliances, for cooking, for water heating, for heating, and for the minor services, the stage has been reached and passed at which, from all points of view—commercial, technical, utility, safety, and so on—domestic electrification can be fostered with the utmost confidence on a keen competitive basis, that is, of course, where supply tariffs permit.

Fig. 1.—All-enamelled " Tricity " Table Cooker.

There are several innovations to be seen on the stands, some to increase the attractiveness of the apparatus—an excellent sign that the point of stability has been reached—but some also which serve for increasing the efficiency, strength, safety, portability, &c., of the appliances. Generally speaking, the domestic electrical exhibits might be summed up as a display of artistic enamelling. Practically every domestic article imaginable, from cookers to flat-irons, can now be purchased in any and many beautiful enamel finishes. Indeed, it must be safe to say nowadays that no modern domestic electrical appliance factory can be considered complete without up-to-date art-enamelling plant.

To deal with cookers first, several makers have had all their standard models made available with vitreous enamel finishes; others, for standardising purposes, have had the enamelling applied to a few selected models only, while some makers have produced entirely new models for the application of the enamelling. Mottled-grey seems to be the favourite finish, " rough " or " smooth," but one is occasionally " shocked " by cookers in all manner of colours. On the stand of Credenda Conduits, Ltd., for instance, may be seen a " Creda " standard cooker finished in enamelling of two greens and a red. We were informed that there is a big demand for such equipment in America, and also a growing demand in this country. A very interesting and attractive all-enamelled mottled cooker is the new No. 754 " Tricity " self-contained table cooker, fig. 1, of the British Electric Transformer Co., Ltd. This has several unusual features, such as the door to the hot-cupboard, which is opened downwards and slides in under the bottom of the cupboard. The arrangement of the switches along the sloping board beneath the hot-cupboard is also a pleasing addition to a cooker of British make. The three boiling plates measure 7 in. by 7 in., each loaded at 1,600 W. The grill dimensions are 13 in. by 9 in., and its loading is also 1,600 W, while the oven, 20½ in. by 17½ in. by 14½ in., has a loading of 3,000 W. Three-heat control is provided for all parts. This cooker is designed to serve for the requirements of

14 persons. A smaller all-enamelled "Tricity" model is No. 721, which is designed for families of up to eight persons. The loadings are as follows: oven, 2,500 W; grill, 1,200 W; boiling plates, No. 1, 2,000 W, No. 2, 1,600 W. The overall dimensions are 37 in. high by 29 in. wide by 23 in. deep. Top and bottom heating is provided in the "Tricity" cookers.

Fig. 2.—The "P2 Carron" Model.

The disposition of the elements is evidently still an unsettled point among manufacturers, and the exhibits at Birmingham show all manner of combinations of top, bottom, and side heating.

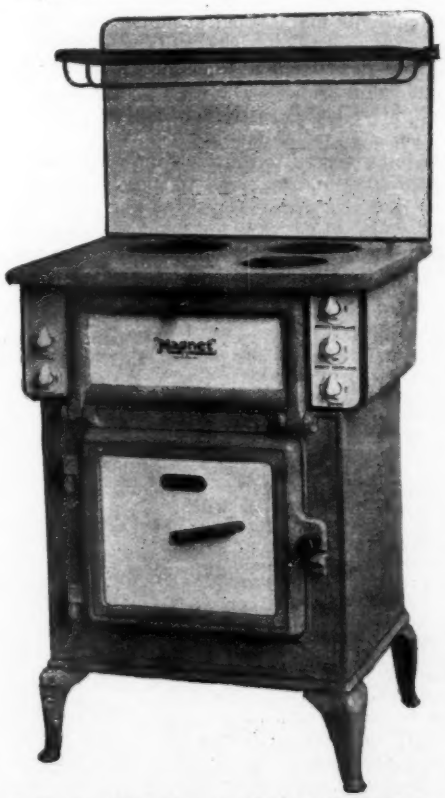


Fig. 4.—The New "Magnet" Cooker.

A happy solution of the problem seems to have been arrived at in the new "Magnet" cooker, fig. 4, of the General Electric Co., Ltd. In this all-enamelled model the oven-element bus-bars are continuous round the two sides and bottom of the oven, and the element units may, at will, by the consumer himself, perhaps, be arranged by a simple bolt-on arrangement for wholly side or side and bottom heating. The oven interior is completely removable; it is enamelled on both sides, and the corners are rounded. The enamelling in this case is extended even to the grill pan. A new feature is a double catch on the hot-cupboard door. The door drops half-way down and "catches"; a slight lift allows it to be lowered to the final open position. Drip-trays are arranged around all the boiling rings, and a second crown plate slides immediately under the boiling plates. The boiling plates are of the General Electric Co.'s own

Fig. 3.—"Revo All-Plug-in" Cooker.

Fig. 5.—The Medium "Aurora" Cooker.

manufacture, and are available for practically all standard voltages. The fixing of each plate is by means of a central bolt and wing nut, facilitating the centring and lining up of the plate. Wing nuts are also employed for the electrical connections for the elements. A further important feature of the new " Magnet " cooker is that the wiring on the side of the cooker can be removed as a complete unit and taken to a bench for repair, &c. The cooker is designated D.C. 5,732 L.T.G. The oven dimensions are 16 in. by 16 in. by 14 in., and the loading is 2,800 W; the boiling plates, 6-in., 7-in., and

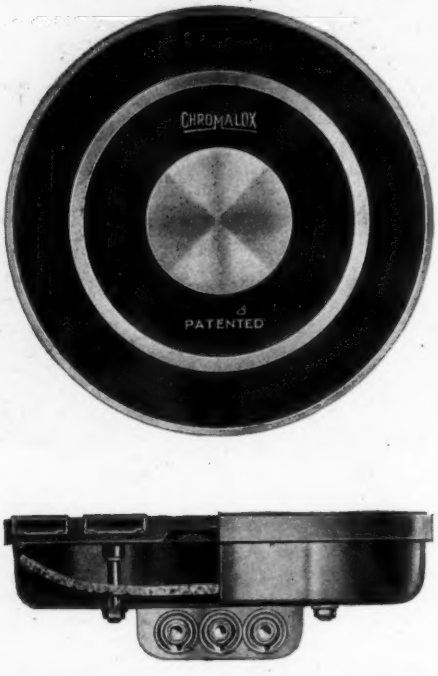


Fig. 6.—Construction of " Chromalox " Boiling Unit.

8-in., are loaded at 1,000, 1,200, and 1,600 W. respectively.

Another cooker in the design of which special attention has been paid to the wiring assembly and general accessibility is the new P2 cooker of Carron cooker, fig. 2. This model resembles the old No. 310 cooker, but while retaining certain characteristics it has been redesigned and brought into line with modern standards and requirements. Top and bottom heating is employed. The overall dimensions are 37 in. high, 24 in. wide and 18½ in. deep. The loadings are: oven, 1,800 W; hot-closet, 1,600 W; 8¾-in. boiling plate, 2,000 W; 7-in. boiling plate, 1,200 W.

The products of newcomers into the industry are always looked forward to, and in this connection the following details of the " Aurora " cookers introduced by Messrs. A. Kenrick & Sons, Ltd., will no doubt prove of unusual interest. There are three standard models with overall dimensions of 36 in. by 23 in. by 18 in., 36 in. by 26 in. by 19 in., and 36 in. by 28 in. by 20 in., and a " Junior " type cooker. The oven loadings of the small, medium and large sizes are 2.0 kW, 2.4 kW and 2.4 kW, respectively. All the grills are loaded at 1.5 kW, and the boiling plate of the small cooker is of 1.75 kW, while the two plates of the medium cooker are loaded at 1.75 kW and 1.25 kW and each plate on the large cooker has a loading of 1.75 kW. All the elements, oven and hob, are made up of " Chromalox " heating units manufactured by Messrs. Geo. Bray & Co., Ltd. It is worth repeating that these units are constructed of a heating element of nickel-chromium ribbon, or coil, embedded in a refractory material under hydraulic pressure, the whole being entirely enclosed in a chromium-iron sheathing which is capable, it is claimed, of withstanding high temperatures without oxidisation. For the boiling plates the units are in ring form and fixed in cast-iron supporting plates. The construction of the boiling plates is depicted in fig. 6. The elements for the oven are the " Chromalox " units in simple straight bar form. Each bar is fitted with a plug terminal at each end, and the plugs are received by suitable sockets. There are six bars in each oven, and bottom heating only is used as the result of experience obtained in the large electrically equipped works canteen of Messrs. Kenrick & Sons. Fig. 5 shows the medium size " Aurora " cooker. The hob is hinged, and all the models are finished in mottled enamelling, in which direction Messrs. Kenrick claim an unusual experience.

An excellent example of apparatus employing plug-in units is a new " All-plug-in ", cooker which is being displayed by Revo Electric Co., Ltd.; indeed, the makers believe that it is the only completely plug-in cooker which has so far appeared on the market. Side and bottom heating is provided for the oven, and in each case, side or bottom, the elements are made up in one totally metal-enclosed unit. The elements operate at black heat, so that breakdown is reduced to an absolute minimum. Grid-type guards protect the element units in the oven. The whole of the metal-work, on both sides, is enamelled. The boiling plates and grill all employ the plug-in feature. Fig. 3 shows the " Revo All-plug-in " cooker with various parts dis-assembled. This and other " Revo " cookers on show carry excellent examples of modern enamel finishes.

Most of the standard cookers of the Jackson Electric Stove Co., Ltd., are now available with enamelled finishes, some good specimens of which are to be seen on the company's stand at the Fair. The latest all-enamelled introduction is the " Jackson Junior," which is also available in table model form (see our issue of February 14th, p. 321). One of the " Jackson Junior " models has been recently tried out and subjected to tests at the Good Housekeeping Institute with very good results. The oven was used for roasting, boiling, grilling, bread and cake baking, &c. In order to make the greatest possible use of the hot plate it was found advisable to cook with square saucepans, and in this way four pans could be accommodated over the one element and the contents maintained at simmering temperature without any difficulty. The grill was found to heat rapidly and was sufficiently hot for use after preheating for about five minutes. The oven also heated comparatively rapidly, being ready for baking in from 20 to 25 minutes after switching on.

In the test referred to below all the water required for cooking vegetables, &c., was purposely heated on the stove, so that the figures represent maximum consumption. The meal cooked was for 4-6 persons and consisted of roast beef, Yorkshire pudding, roast potatoes, vegetable marrow, fruit pie and custard.

TEST.

Time.		Temp. of oven.	Adjustment of oven element.
10.37	Electricity switched on		
11.0		410° F.	
11.5	Meat put in.	500° F.	High
11.10		—	Low
11.30		410° F.	Medium.
11.35		410° F.	High
11.40	Potatoes put in around meat.	420° F.	
11.45	Pie put in. Hot-plate switched on to full.	450° F.	
11.50	3 pints of water put on.		
12.5	Custard made.		
12.15	Pie removed, dripping put in for Yorkshire pudding, and marrow put in boiling water.		
12.25	Potatoes turned. Yorkshire pudding put in.	410° F.	
12.30	Marrow boiled. Switch turned to low.		
12.35		490° F.	Medium.
12.50	Marrow stopped boiling. Hot-plate element turned to high.		
12.55	Everything served. Gravy made.		
1.0	Electricity switched off.		
	First reading of meter	772.53	
	Second reading of meter	776.825	
	Current consumed	4.295 units.	

Remarks.—Everything satisfactorily cooked, but some care had to be exercised in the choice of dishes in order to accommodate them satisfactorily in the oven.

The Electroplaters' Convention.

Report of the topics discussed, and the exhibits displayed, at the annual meeting of the Electroplaters' and Depositors' Technical Society.

THE Electroplaters' and Depositors' Technical Society recently held its annual convention in London at the Northampton Polytechnic Institute. One of its most interesting features was an exhibition, representative of modern practical advances, which may be claimed to have been the first of its kind held in this country devoted entirely to the many phases of electro-deposition. It indicated the big developments which have taken place in the technique of electro-depositing metals, most of which have occurred within the post-war period. The remarkable interest the exhibition aroused was therefore not surprising, the room being crowded throughout the day, and the subsequent meetings were attended by a large number of members and visitors who came from all parts of the country.

The afternoon meeting was addressed by Dr. W. Rosenhain, F.R.S., of the National Physical Laboratory, and the evening session was devoted to a two-hour discussion on "The Present Position of Chromium Plating," the attendance being in excess of 200 people. Dr. R. S. Hutton, director of the British Non-Ferrous Metals Research Association and president of the Electroplaters' and Depositors' Technical Society, was in the chair.

Dr. W. Rosenhain's Address.

Dr. W. Rosenhain's address on "Research and Practice," pointed out, *inter alia*, that co-operative effort between science and industry would make available better methods and better men, and result in the pooling of knowledge from which there was everything to gain and nothing to lose. Electroplating research difficulties had been overcome by attacking them under simple and carefully controlled conditions by trained men undistracted by production worries. He instanced the work which had been done under the auspices of the Electrodeposition Committee of the Department of Scientific and Industrial Research, *e.g.*, the valuable results on pitting achieved at Woolwich and the reduction in stress of nickel deposits by the use of super-imposed alternating current and the deposition of a layer of lead between the base metal and the nickel; also the prevention of corrosion by means of cadmium and zinc, and the deposition of chromium. In conclusion, he stressed the fact that the application of research to practice must not be considered as a "get-rich-quick" method, and the importance of co-operative research, in which industry should take its part.

The Exhibition.

The exhibition may be said to have been fully representative of every phase of electrodeposition art and science, which phases may be broadly classified as follows:—

Electroplating for Decoration and Protection.—The decorative effect was naturally largely represented by the newest metal with which the electroplater has recently become familiar, namely, chromium, and several of its applications in industry were to be seen, particularly automobile parts, household and sanitary fittings. The exhibits of Messrs. W. Canning & Co., Ltd., Grauer & Weil, and J. Nixon & Co., illustrated the excellent type of chromium deposit it is possible to obtain to-day, while the meritorious exhibit of the Kings Cross & Attwood Plating Co. indicated how far the plater has gone in solving the problem of the poor "throwing power" of the chromium-plating solution.

Electroplating for corrosion prevention was illustrated by exhibits of zinc and the more recently adopted cadmium plating upon iron and steel parts. The Royal Aircraft Establishment of Farnborough exhibited examples of zinc and cadmium plating upon aluminium. The exhibit of Mr. Ulick R. Evans was very interesting; it consisted of deposited and other coatings upon iron after they had been submitted to corrosion tests. The Royal Aircraft Establishment also exhibited samples of aluminium to which the anodic process had been applied, together with specimens of a film of aluminium oxide which had been separated, the thickness of which was one eighty-thousandth of an inch. A special exhibit sent by Dr. Mueller from the Physikalisch-Technisches Reichsanstallt, Charlottenburg, Berlin, consisted of gold and nickel foil, the former 60 millimetres and the latter 80 millimetres in diameter, the thickness of each being only 0.00002 millimetre. Those films, although completely transparent, were entirely free from pores. One of the applications of such films is for use as windows for vacuum cathode-ray tubes, for which purpose they are supported on grids. This exhibit illustrated in striking fashion the high degree of perfection it is possible to achieve in electro-deposition under scientifically controlled conditions. It is interesting to add that Dr. Mueller has exhibited elsewhere similar foils ranging in thickness from 0.00002 to 0.001 mm., both polished and matte, and that it is possible to read printed type through six layers of the foil.

Electrotyping, &c.—The applications of electro-deposition to art were shown by several firms. The Standard Plating and Kupron Works showed some excellent examples of art-metal work, in particular deposits on porcelain, plaster, and glass; while the British Metallising Co. had a very effective exhibit of silverware, in particular silver deposits made by its cold colloidal process upon vulcanite, glass, and cellulose acetate, while chromium deposits on bakelite, ebonite and other insulators were also shown. The exhibit of the London School of Printing illustrating the production of stereo- and electrotypes was much admired, while that of the Gramophone Co., Ltd., illustrating the production of "master" gramophone records aroused considerable interest, as also did the solid objects, trays, tubes, &c., produced purely by electro-deposition and exhibited by Mr. Sherard Cowper-Coles.

Thick Deposits.—In contrast to the thin deposits just mentioned, one of the most interesting exhibits illustrated one of the newest and most valuable applications of electro-deposition, *viz.*, the repair of worn parts of machinery by "building" them up with electro-deposited metal and then machining or trimming them down to the size required. Messrs. Thos. Try, Ltd., showed examples of built-up engineering parts, nickel as well as iron, with deposits as thick as ¼ in. Similar thick deposits were also shown by the Research Department of Woolwich Arsenal.

Precious Metals.—Messrs. Johnson Matthey & Co., Ltd., displayed precious-metal deposition, deposits of platinum and palladium being shown as well as platinum black; also electrolytically-refined gold and silver of high purity. Messrs. Boosey exhibited some fine silver plating upon large musical instruments of complicated design, showing remarkable uniformity, and also chromium-plated instruments indicative of high throwing power.

Other Developments.—Messrs. Eck & Brook showed a photograph of a motor-generator which is claimed to be the largest to be installed in this country for chromium-plating work. It is capable of delivering 12,000 amps. at 6 volts, while it can be quickly changed over to 6,000 amps. and 12 volts. They also exhibited a "Multithermograph" capable of recording a number of miscellaneous readings of the bath and electrical conditions obtaining. Standard Telephones & Cables, Ltd., showed electrolytic iron of a high state of purity used to manufacture coil cores, &c., of given electro-magnetic properties by hydraulic pressure exerted on the iron powder in a mould.

Woolwich Arsenal Display.—Probably the most comprehensive exhibit of all was that of the Research Department at Woolwich Arsenal. Various aspects of nickel deposition in which the department is particularly interested were illustrated. A number of methods of rapidly measuring the pH of a nickel solution, including the comparator, the Woulff pH testing set, and celluloid strips impregnated with an indicator solution, giving a series of colours, were shown. Chromium-plating, which is file-proof, and examples of both ductile and brittle chromium deposits were on view. Apparatus to illustrate the thickness of the sound nickel it is possible to obtain, the formation of pits, cracks, and peeling, with which the department has been experimenting, and the effect of impurities in the solution upon the deposit, was ingeniously arranged, and specimens showing the ductility and stress in nickel deposits produced under different conditions were also shown. Probably the most interesting exhibit to the technical visitor was that illustrating the X-ray spectra of deposited nickel, showing in striking fashion the difference between hard and soft nickel deposits. The soft deposit is built up of nickel crystals, nearly all of which have their cube faces nearly parallel to the plane of the deposit, but have a random orientation about the direction of the current. The hard deposit is built up mainly of a random arrangement of nickel crystals, but there is an appreciable number of crystals with their dodecahedral planes parallel to the plane of the deposit, thus giving a weak symmetrical pattern in the perpendicular spectrum.

Bedfordshire Rural Electrification.

Résumé of the Electricity Commissioners' descriptive memorandum on the scope and nature of their experimental demonstration scheme.

IT will be recalled that in the latter part of 1927 the Electricity Commissioners were asked by the Minister of Transport to investigate the practicability of proceeding with the electrification of rural areas at a more rapid rate than had hitherto been regarded as possible, and to prepare for the Minister's consideration a scheme to demonstrate the potentialities in typical agricultural areas. As was explained in the ninth annual report of the Electricity Commissioners for 1928-1929, a demonstration scheme was prepared, and in view of the inquiries which have been received for information about the nature and scope of the scheme, a descriptive memorandum has been prepared by the Electricity Commissioners and issued with the approval of the Minister of Transport.* It indicates the object of the scheme to be the comprehensive and rapid electrification of a typical rural area in which mixed farming is the main industry and electricity has not been previously available, so that within a period of about two years supplies for all purposes will be within the reach of practically all the inhabitants. The area is part of the authorised area of supply of the Bedford Corporation; the accompanying map, fig. 1, shows the area selected and the contemplated lay-out of the transmission system. It is 101 square miles in extent with a population (based on the 1921 census) of 15,860, and includes 29 parishes and 4,038 occupied dwellings. The average density of the population is thus 157 per square mile, practically the same as the general average of 151 per square mile for all rural areas in England and Wales. An additional area of 5,030 acres about Maulden and Clophill (2 parishes, 2,075 population, 535 dwellings) has been included, but does not merit special reference.

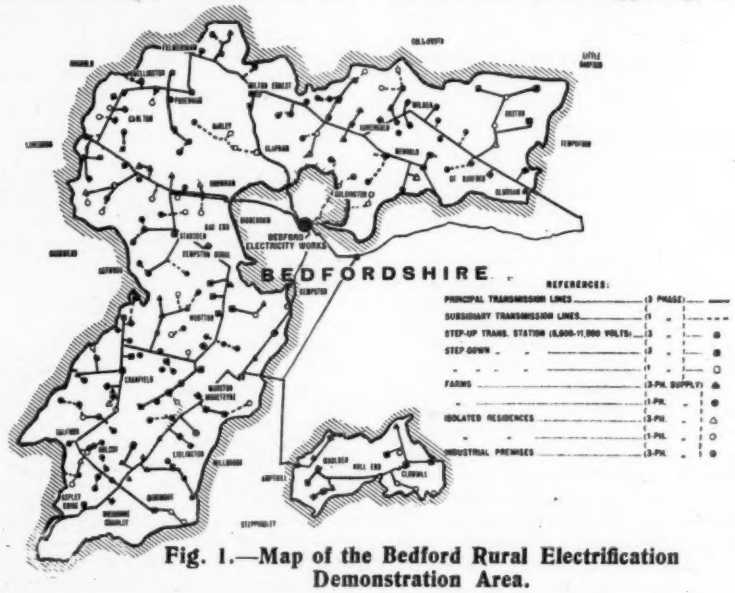


Fig. 1.—Map of the Bedford Rural Electrification Demonstration Area.

About three-quarters of the land is cultivated, a large proportion being devoted to corn raising, while the remainder is largely pasture. The area contains two brickworks, which are already connected to the supply system of the Corporation and account for a substantial consumption of electricity; other small industries may become consumers in due course. Public supplies of gas are available in only three of the villages, namely, Apsley Guise, Goldington, and Turvey.

The technical scheme is based upon a supply of electricity in bulk obtained from Bedford, which occupies a fairly central position in relation to the area and is a "grid" point under the South-East England electricity scheme.† It involves the construction of a network of about 56 miles of three-phase overhead transmission lines at 11,000 volts (as shown on the map). In completing the circuit, use will be made of about 7 miles of existing underground cable, which runs from Bedford to Sandy, and also of one or two other existing lines. Smaller villages, isolated residences, and farms are to be supplied from single-phase extensions, representing a further 87 miles of 11,000-volt overhead lines. The voltage of transmission at Bedford has hitherto been 6 600 volts, but provision has been made in the scheme for stepping up to 11 000 volts at four transforming points, namely, Wootton Pillinge, Harrowden, Bromham, and Milton Ernest; either brick-built substations or kiosks are contemplated of a capacity of 500 kVA in three cases and of 200 kVA in the other. Supplies to villages and isolated consumers will be given by means of pole transformers of the following proposed standard sizes, namely, 50, 20, and 10 kVA for three-phase, and 20, 10, and 5 kVA for single-phase supplies. With regard to low-voltage distribution in villages, involving about 45 miles of lines, it is anticipated that in most cases a neat overhead system which will not interfere with the amenities will prove possible; but a margin has been allowed in the estimates in case a certain amount of underground distribution should prove necessary in some instances. The voltages adopted for distribution are 400/230 volts.

The whole of the transmission system will be constructed within two years, and thereafter the only additional capital expenditure will be that incurred in connecting new consumers. The total capital cost for the main area, including all service connections and meters on consumers' premises, is estimated to be £116,250, based upon the use of cadmium-copper and steel conductors for the overhead lines. No provision has been made in the estimates for capital expenditure on the provision of assisted-wiring and of apparatus on hire or hire-purchase, as the nature of such facilities to be offered has not been settled. In so far as the assisted-wiring and hire facilities are not self-supporting, the estimated financial results of operation would be adversely affected to that extent.

By the end of six years about 75 per cent. of all the dwellings in the demonstration area should be connected, and the sale of electricity will have grown by that year to an average of about 130 kWh per head of population, or 700 kWh per connection.

The estimates of revenue are based upon the assumed adoption of an attractive two-part tariff for domestic supplies and of suitable alternative flat rates for consumers taking supplies for lighting and / or power only. They should yield an average revenue from all classes of supply taken collectively of 2.4d. per kWh sold, this being considered a reasonable figure under the assumed conditions of development. By the sixth year the revenue from dwellings and farms will thus be equivalent to an average of £1.3 per head of population, or £7 per connection. The annual growth will, it is estimated, be as is shown here under :—

Year of working.	1st.	2nd.	3rd.	4th.	5th.	6th.
Number of connections at beginning of year	808	1,655	2,221	2.624	2,907	3,028
Total units sold (thousands) ...	870	1,380	1,720	1,940	2,080	2,110
Units sold per head of population	55	87	108	122	131	133
Total revenue ...	£8,700	13,800	17,200	19,400	20,800	21,100

The cost per kWh delivered to the system has been taken on the basis of a two-part charge giving an average of 0.85d. per kWh at the outset, decreasing thereafter to an average of 0.55d. per kWh in the sixth year of operation. Interest has been charged at 5 per cent. and sinking fund payments are taken as accumulating at 3½ per cent. In respect of certain items of capital expenditure, such as transmission lines, not productive of full revenue in the initial years, provision has been made for the suspension of sinking fund payments for five years. After providing for interest on bank overdraft (revenue account), the estimates show deficits on net revenue account in the constructional year and the first two years of operation, but surpluses in each of the years thereafter; such surpluses being sufficient to place the scheme on a remunerative basis in the course of a few years of working.

The Corporation of Bedford agreed to co-operate in carrying out the demonstration, subject to being given some financial

* H.M. Stationery Office, 6d. net; six pages with map.

† ELEC. REV. Oct. 7th, 1927, p. 604, and Feb. 24th, 1928, p. 326.

guarantee. As the outcome of an application made by the Corporation under the Development and Road Improvement Funds Act, 1909, the Treasury agreed to make advances to the Corporation from the Development Fund during a period not exceeding 10 years of such sums (not exceeding £8,000) as might be required to meet 75 per cent. of the actual annual deficits (if any) on the working of the scheme, such advances to be subsequently repayable out of surpluses, on condition that the scheme should be subject to the general surveillance of the Electricity Commissioners.

The preliminary plans for the lay-out of the transmission system have been approved and the final plans and specifications have now been prepared. The task of obtaining wayleaves is already in hand. A suitable scheme of propaganda is to be carried out by the British Electrical Development Association, subject to the general approval of the Bedford Corporation. A sales engineer and cost accountant for the whole of the Bedford area of supply have been appointed by the Corporation, and premises for a town showroom have been acquired. Supplies, which will be included in the scheme, are already being given in ten parishes, and it is anticipated that supplies will be available during the summer of 1930 in other parts of the demonstration area, and by the early part of 1931 in the whole of the area.

Educating the Architect.

The Fifth E.D.A. Conference of the 1929-1930 Season.

THE problem of ways and means of educating architects and builders to regard electrical installations as part and parcel of the buildings for which they are responsible, and not to treat them as an afterthought (as the chairman, Mr. Ll. B. ATKINSON, put it) was discussed at the Electrical Development Association conference held at the Royal Society of Arts in London on February 21st.

The discussion was opened by Mr. C. H. FLOWER, who said that the industry did not spend enough money on advertising electricity. In the absence of sufficient money to exercise mass persuasion, however, they must reason with architects individually whenever they had a chance, and impress upon them the ever-improving service which electricity offered. It must be urged upon architects and builders continually that they should not determine an order on the basis of price alone, but should compare the details of offers, for it was the details which mattered to users, and the details that cost money, though they might be well worth the money they cost. He was critical of the system of charging for installations on the basis of cost per point, because as the number of points increased, the cost of material and labour per point was reduced. People were learning very rapidly to expect the fullest facilities for using electricity, and those in the industry must try tactfully to convey to the architect that he would not earn the thanks of his clients if their premises were not completely up-to-date. Similarly, the builder must be persuaded that a generous electrical equipment was a wise outlay, because of its tremendous selling power when he put his house on the market. By adding 1½ or 2 per cent. to the cost of the house, the builder would make a quick sale at a better price, because of the growing demand for electrical facilities. In view of the fact that electricity was becoming really cheap in many districts, it was worth considering the omission of flues and chimneys and spending some, but by no means all, of the money so saved in the construction of a house on a generous electrical installation. The rapid fall in the cost of electricity had been indicated by figures recently supplied by Lieut.-Col. Vignoles (director of E.D.A.), which showed that whereas in 1928 26 per cent. of the population could obtain electricity for domestic purposes other than lighting at ¾d. per kWh or less, in 1929 the percentage was 40. The percentage able to obtain it at 1d. per unit or less in 1928 was 52, and in 1929 it was 65.

He considered that many architects and most builders did not yet fully appreciate the adaptability of electric light; to take full advantage of that adaptability much of the lighting should be considered in detail before construction started. Further, a much freer use should be made of wall sockets; in large living rooms floor sockets at or near the centre were worth consideration. Whilst agreeing that it was often necessary to raise the general intensity of light in offices, he did not consider that private houses required high general intensity; adequate local lighting, and light and shade effects, were more agreeable in private rooms than good general light.

Another indication of the rapidity with which the demand for electrical service was growing, which emphasised again the importance of providing generous installations in the first place, was the fact that the increase in the number of cookers let out on hire last year by only 58 representative undertakings was not less than 10,000, representing an increase of 23 per cent. for the year. Incidentally, he asked if it could be regarded as sound practice to connect a large cooker of, say, 15 kW total loading to more than one phase, and whether those responsible would be prepared to connect them to 400 V.

Mr. PERCY ROSLING was of the opinion that the E.D.A. was working on the right lines in trying to educate the public as well as the architects and builders to insist upon the provision of good installations, and not to buy the cheapest, without knowledge of what they were getting for their money.

Mr. A. N. EAST said that although local authorities were probably building more houses than individual builders, and in many cases had assisted wiring schemes, he doubted whether more than 5 per cent. of those schemes made provision for anything beyond lighting. If the local authorities did the proper thing, the architects would be bound to follow their lead.

Mr. H. BOURNE said that his experience showed that one system of wiring for all purposes was not cheaper than separate systems for lighting and power. A single system for the double purpose, with one set of fuse-gear, and so on, was not desirable, and it was difficult to protect the smaller appliances. He also regarded the introduction of two phases into domestic appliances as extremely dangerous.

Lieut.-Col. W. A. VIGNOLES (Director and Secretary of E.D.A.) maintained that architects were becoming interested in electricity in two or three directions, as, for instance, in its use as part and parcel of schemes of decoration, and said that some of the results achieved by considering the lighting and decoration of buildings together were very satisfactory. He commented upon the progress of the E.D.A. Electric Homes (Outlet) Campaign. It was having a considerable effect, and they hoped that the specification for wiring issued by the E.D.A. for the benefit of the public would help them to realise what they ought to demand. The campaign included propaganda to architects and builders, by means of lectures, and so forth. Architects were becoming more interested in refrigeration and water heating, particularly in blocks of flats, where in some cases refrigeration was provided by a central plant.

Mr. CALVERT was concerned to know why it was that architects responsible for buildings, although they were content to leave the plumbing to a plumber and other specialised work to the appropriate people, plunged into the heating and lighting problems themselves, dealing with them more from the decorative than the efficiency point of view. One result of that was that electrical contractors were asked to provide an intensity of lighting which it was impossible to provide under the conditions specified. Discussing the sort of information which would be appreciated by architects, he pointed out that inasmuch as there must be a tremendous amount of work for the architect in the way of re-decoration and reconstruction when wiring was being carried out, they would be interested to know the number of houses wired for electric lighting and heating in the United Kingdom.

Lieut.-Col. VIGNOLES said it was between 2 and 2¼ millions.

Mr. CALVERT added that authoritative information concerning the reductions of charges by supply authorities would also interest them.

Mr. H. T. P. MOORE, who has an all-electric house, gave figures which showed that, although electricity was used judiciously and economically, the quantity consumed was considerable. His purpose in mentioning it was to lay stress upon the fact that the price of electricity must determine whether a person would or would not electrify his home completely.

Mr. S. J. PATMORE urged the importance of providing lighting of high intensity in the home, so that people would become accustomed to it and demand it elsewhere. He also emphasised the value of multi-circuit systems in this connection.

Mr. H. T. YOUNG, as an example of the necessity for educating builders—who mattered, perhaps, more than the architects in the suburban areas—instanced a case in which a builder, who was selling his houses wired for electric lighting and heating, had looped all the points right through, so that only one radiator could be used in the house at any one time. As to the architects, who influenced the use of electricity to a large extent in the centres of the towns and cities, he was of opinion that the creation of a desire on the part of the public by methods such as were being adopted by the E.D.A., would influence the architects more than

would visits by representatives of the trade upon the architects themselves. He suggested that supply engineers might call together the contractors in their districts and investigate what was being done there, so that they could co-operate and endeavour to prevent the carrying out of inadequate and unsatisfactory installations at low prices.

Mr. D. C. PEARMAN was of the opinion that when people saw good lighting they wanted it in their own homes, and would not quibble about the cost.

Mrs. ROWE, who has an extensive electrical installation in her own home, testified to its great value and convenience, and urged that every effort should be made to educate housewives in its value, because their influence was very considerable.

Mr. COVELL suggested that it would probably pay employers in the electrical industry to give electrical apparatus free to some members of their staffs for their own use, because until one lived with electricity one could not appreciate fully its great advantages.

Mr. F. STRANGE said that if apparatus in a house were run off one phase it might happen that, when the cooker was turned on, the lights in other parts of the house would be dimmed. He suggested that that could be cured by putting the heavy apparatus on a separate phase.

Mr. C. H. RAYNER (Manchester), referring to his own house, which was practically all-electric, consuming between 3,000 and 4,000 kWh per quarter, at ½d. per kWh plus the fixed charge, regarded it as economically sound. He emphasised the importance of ensuring that plugs and wiring should be capable of being used for other apparatus than merely standard lamps.

The CHAIRMAN regarded an installation at 400 volts in a house as undesirable, having regard to the lack of supervision and the possibilities of carelessness or accident, and did not think that the installation of separate systems for power and lighting would add much to the cost of a domestic installation. As an example of the manner in which some architects treated electrical installations, he mentioned an extensive installation, for which an architect was responsible, controlled by one fuse only, so that if anything went wrong at any part the whole of the premises were affected.

Mr. FLOWER, in the course of a brief reply, mentioned the phase problem, and expressed a preference for keeping two phases out of one room, though it was difficult to arrange sometimes for the power and lighting to be on the same phase. He said that although there was one system of wiring from the supply undertaking's fuses to the distribution board, the consumer could have two fuseboards.

Daventry's Signal Strength.

An outline of the curious effects observed in Cornwall when measuring the signal strength of the Daventry (5XX) radio-telephone broadcasting station.*

By J. H. REYNER, B.Sc., A.M.I.E.E.

IN connection with the testing of radio-telephone receivers,† information was desired concerning the field strength in Cornwall (that district being known to be poor from the point of view of reception) of the British Broadcasting Corporation's high-power transmitting station at Daventry (5XX; 1,554.4 m., 193 kc/s).

An investigation was accordingly carried out with the aid of portable measuring equipment. At first there appeared to be little unusual, beyond the fact that the signal strength was lower than had been anticipated. Moreover, it was at once apparent that the contours were not circular, or even approximately so, in formation, being rather in the nature of a wedge in which the high signal-strength areas extended further west inland than on the coast, as if the coast-line were exercising some marked absorbing effect. Apart from this, however, the contours were not unusual, being of the character indicated in fig. 1. Further readings when compared with the theoretical expectations were not in agreement, and the discrepancies were for some time very puzzling. In some cases the signal strength would be distinctly lower than was anticipated, while in other cases it would be higher. Another curious effect was that in the Perranporth district the signal strength on the coast-line was approximately half that on the hilltop, only two miles inland; this effect was confirmed by local residents.

The masts of the Bodmin beam radio-telegraph station suggested the possibility of a radio shadow and the results obtained appeared to bear out the suggestion remarkably well, the final contours being shown in fig. 1. On the north-east side of the Bodmin beam station the strength is of a normal order and in conformity with the general contours; less than 10 miles to the south-west, however (on the other side of the Bodmin masts), the strength falls to approximately half its former value. Moreover, this region of bad reception extends in an almost direct line from Daventry through Bodmin as far as Redruth, a distance of 25 miles.

A further interesting point is that surrounding this area of low signal strength is a ridge of good reception. Thus, as one goes out towards the coast from a central point, such as Truro, the signal strength rises on either side and then falls away rapidly towards the coast-line. What is, perhaps, more peculiar is that as one proceeds farther west the signal strength rises at first, instead of falling, and then subsequently attenuates very rapidly. Particular care was taken to confirm that this belt of good reception did actually exist immediately beyond the dead area around the Truro district. In the short distance between Camborne and Penzance, for example, the signal strength falls to nearly one-third of its initial value, while the effects already cited of the very rapid drop in signal strength along the coast-line in such localities as Perranporth are attributable to the same cause.

Whether the shadow effect is actually produced by the Bodmin masts can only be definitely confirmed by further experiments. There is, of course, the possibility that the curious configuration of the contours is due to mineral deposits.

The first check calculation was the effective height of the 5XX aerial as deduced from the observed field strength at Elstree. As the distance from Daventry is 90 km, there is little likelihood of serious attenuation. An estimate from Sommerfeld's formula was 4 per cent. On this assumption,

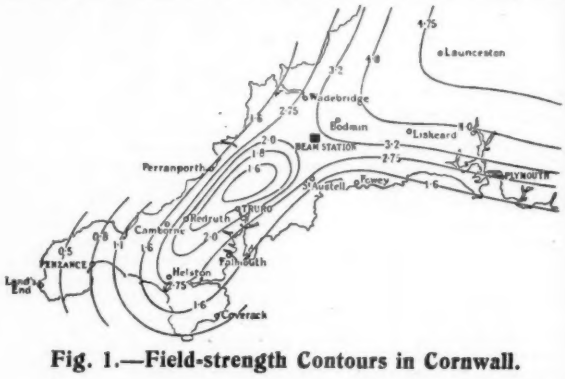


Fig. 1.—Field-strength Contours in Cornwall.

the un-attenuated field strength at Elstree would be 13.0 millivolts per metre, approximately. Thus the effective height of the 5XX aerial, based on an assumption of 60 amperes aerial current, would be 80.5 m.‡ The 5XX masts are 164 m. high, the aerial being of T shape and the down-lead being approximately 130 m. high. In the light of these figures, the value of effective height appears to be eminently reasonable.

The second check was on the signal strength actually received in Cornwall, as compared with the theoretical value calculated from the usual formula, but the distorted contours made it somewhat difficult to decide what to take as the mean strength at any given distance from Daventry. Probably the most satisfactory procedure is to take a mean value, as has been done in the following table:—

Distance from 5XX. km.	Theoretical field strength (un-attenuated). mV/m.	Mean observed field strength. mV/m.	Ratio. per cent.
280	4.18	3.8	90.5
305	3.81	3.2	84.0
335	3.5	2.5	71.5
360	3.27	1.6	49.0
385	3.04	0.8	26.3

It will be observed that up to 300 km. the attenuation is fairly small, but not unreasonably so, and the figures coincide approximately with the values obtained from Sommerfeld's theory. Beyond this point, however, the attenuation is increasingly rapid, and at Land's End, which is only 400 km. away, the field strength is less than one-quarter of its theoretical value.

* Extracts from a paper published (unread) in the I.E.E. *Journal*.

† ELEC. REV., January 24th, 1930, p. 185.

‡ The wave-length at the time of the tests was 1,562.5 m

Chadwick Trust Lectures.

The 18th annual series of Chadwick public lectures now in progress includes "The Outlook for Smokeless Heating" by Dr. Margaret Fishenden, of the Fuel Research Division of the Department of Scientific and Industrial Research. Dr. Fishenden's lecture will be given in the Hall of the Institution of Mechanical Engineers, Storey's Gate, on March 19th or 20th, at 8 p.m. Admission is free, and further particulars can be obtained from the Secretary, 204, Abbey House, S.W.1.

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures.

The F.B.I. and Empire Trade.

The Federation of British Industries has prepared a report upon British economic policy with regard to the Dominions for submission to the British Preparatory Committee to the Imperial Conference. The Federation claims that the report is perhaps the most comprehensive announcement that has yet been made on the various aspects of inter-Imperial trade; it consists of a series of practical conclusions and recommendations with regard to the relations between Great Britain and the self-governing Dominions, including India. Reasons are given for the urgent necessity of developing trade with the Dominions, special attention being drawn to the rapid expansion of the export trade of the United States. The report says that the desire of the Dominions to develop their own industries must be respected, but the artificial stimulation of uneconomic industries should be discouraged. Great Britain should assist, financially and technically, in the establishment of economic enterprises. Migration is dealt with and the solution is said to be the development of prosperity in the Dominions, so that opportunities are provided for emigrants from this country. It is considered that the existing system of inter-Imperial co-ordination is too political in nature and the Federation proposes a conference representative not only of Governments but of industrialists and commercial, shipping and agricultural interests. Such a conference would discuss the terms upon which British trade would be given advantages by the Dominions. The function of the conference would be to act in a constructive advisory capacity to the Imperial Conference. The establishment of an Imperial economic secretariat is also proposed. Other suggestions are that Empire industrial production should be "rationalised" as far as possible; that there should be a closer technical liaison between United Kingdom and Dominion industries; that existing preferences granted by the United Kingdom to the Dominions should not be disturbed; that an organisation should be set up (under the auspices of the Empire Marketing Board) to collect and distribute information regarding Imperial sources of supply; that an Empire College should be established in London; and that air transport should be further developed.

Marking of Imported Cardboard Boxes, &c.

At the offices of the Board of Trade on February 17th, an enquiry was opened into an application by the British Paper Box Manufacturers' Federation for an Order under the Merchandise Marks Act, 1926, that all imported paper and cardboard boxes, cartons, containers, &c., should bear a mark of origin. The Committee consists of Sir Hubert Llewellyn Smith, K.C.B. (chairman), Mr. F. R. Davenport, and Mr. G. N. Barnes.

The applicants were represented by Mr. W. B. Faraday, and among the opponents were the Electrical Importers' and Traders' Association, represented by Mr. N. L. Macaskie, who objected with regard to paper and cardboard boxes, cartons, &c., used for the electrical accessories and wireless apparatus trades.

Mr. W. B. Faraday, for the applicants, said that the British Paper Box Manufacturers' Federation represented 75 per cent. of the total output of the box-making trade in this country. Referring to imports he said that in 1911 there were 8,000 cwt. of paper and cardboard boxes and containers imported, and that quantity had increased steadily year by year until 1929 the imports were 65,000 cwt. The value had increased from £26,000 in 1911 to £196,000 in 1929. The re-exports were negligible. Another matter, said Mr. Faraday, that would undoubtedly be raised in opposition to the application was that to mark as foreign such containers of food and other products made in this country would label the whole contents as foreign when, in fact, they were made in this country. There was, however, no substance in that point because both in Canada and the United States it was the common practice for containers of all kinds to be marked, for example, "Box made abroad." In the present case, therefore, any such risk as he had intimated could be avoided by marking with the words "Box made abroad," or some other indication that the contents were not foreign.

Mr. Macaskie, for the electrical importers, put a large number of questions suggesting that the purchaser of electrical or wireless apparatus was concerned solely with the article inside and not with the carton or container. This point of view, however, was not accepted by witnesses, who asserted that there was a growing demand for British goods and that purchasers preferred to have British boxes if they had the option.

The inquiry was continued on February 18th, when the only matter raised with regard to electrical accessory containers was a reference by one of the applicants' witnesses, Mr. Henry Minch (chairman of the Fibre Board Case Makers' Association, and secretary of the Thompson and Norris Manufacting Co.), who said that a good many boxes of corrugated material were imported from Holland and America. He referred to a circular issued by a firm which was exporting Dutch corrugated boxes to this country. This circular had no indication that the boxes were made abroad.

On February 24th Mr. Macaskie pointed out that manufacturers who used imported boxes were aware of their origin. The importation was negligible when compared with the British production. When counsel for both parties had summed up the evidence the inquiry was concluded.

Imperial Trade.

The thirteenth report of the Imperial Economic Committee, just published (Stationery Office, 6d. net), takes the form of a memorandum on the trade of the British Empire in 1913, and from 1925 to 1928. In this it is shown that world trade in 1927 was estimated to be 20 per cent. greater than in 1913; of this increased trade, the British Empire was responsible for nearly 30 per cent., but on balance was an importer of merchandise. Since 1913 direct trade between Empire and foreign countries has expanded somewhat more rapidly than inter-Imperial trade. In 1927 and 1928 exports from the Empire overseas exceeded those from the United Kingdom by about 40 per cent., although in 1913 they were about 7 per cent. lower. The Dominions' export trade (volume) increased as follows, between 1913 and 1927:—Canada by 100 per cent.; New Zealand, 40 per cent.; South Africa, 18 per cent.; and Australia, 10 per cent. India is meeting its requirements by local production to a greater extent, but in 1927 both imports and exports equalled in volume those of 1913. Against this, the volume of exports from the United Kingdom in 1927, was lower than in 1913, although the volume of imports was greater. In 1927 the United Kingdom imported and used about 40 per cent. more than in 1927; the increase in the imports of foreign produce was about 15 per cent. Exports from the United Kingdom to the Empire overseas were about 9 per cent. less, and those to foreign countries about 30 per cent. lower. These figures exclude the Irish Free State.

The Automobile Electrical Association.

At a meeting of the committee of the Automobile Electrical Association held last week, the decision to confine membership of the Association to those whose business was mainly that of "servicing" the electrical equipment of automobiles and other electrical services but who were not engaged in the repair of engines, chassis, or coachwork, was confirmed. It was also decided to make the secretary's office a clearing house for information of use to members. Every member pledges himself to help any other, and the secretary is to compile a register of sources of special information of the kind which experience will show is most in demand. This confidential service will be supplemented by the issue of a monthly bulletin. The address of the Association is 2, Tichborne Court, High Holborn, W.C.1. The secretary is Mr. H. Scott Hall, M.I.A.E.

Australian Electrical Manufacturers and the Tariff.

In a recent letter to the Melbourne *Age*, Mr. J. Hendry, president of the Electrical Manufacturers' Association of New South Wales, expresses appreciation of the Commonwealth Government "for what has been achieved under the tariff schedule of December 12th by way of effective protection to the electrical manufacturing industry of Australia." The letter continues:—

"Speaking for the electrical manufacturing industry, the new tariff duties must have a most beneficial result. Manufacturers can now build their plans for the future with a better feeling of confidence and security than they have enjoyed for years past. When it is remember that our first approaches to

the National Government, in connection with ironclad switchgear, were made in 1925, and that a recommendation was made by the Tariff Board, but no attempt was made by the late Government to bring that recommendation into effect, one rather doubts the sincerity of the National Government in respect of fiscal assistance to industries of the importance of electrical manufacture. However, the present Labour Government has, in the matter of days, done what the National Government were apparently too apathetic to do in years. This protection to the electrical manufacturing industry will not only ensure stability, but will give that measure of security which is necessary if the industry is to progress. It will enable extensions to be made to existing factories, and will give employment to many who are at present looking for work, and ensure continuity of employment to thousands of Australian workers."

British Manufacturers and Australia.

The Times reports that Mr. J. E. Fenton, Australian Minister for Trade and Customs, met privately on February 19th, at Australia House, 130 representatives of British traders and British trade organisations interested in the Australian market, and discussed with them various points of difficulty regarding trade between the two countries. Sir Arthur Balfour, chairman of the British Council of the Australian Association of British Manufacturers, was in the chair. Statements were made by a number of delegates, including Mr. Robinson (British Electrical and Allied Manufacturers' Association), and Mr. Langham (British Aluminium Co., Ltd.). The Federation of British Industries, the Association of British Chambers of Commerce, the National Union of Manufacturers, the British Engineers' Association, and many other bodies were also represented.

Spanish Electrical Schemes.

The Commercial Secretary, in Madrid, has transmitted to the Department of Overseas Trade a translated extract from an article relating to the development of the Spanish national electrical industry during 1929, published on January 10th, by *La Energia Electrica*. In the course of this it is stated that the outstanding feature of the year, so far as the national electrical industry was concerned, was the commencement of the works for harnessing the great falls of the Duero, for which a concession is held by the Sociedad Hispano-Portuguesa de Transportes Electricos Saltos del Duero, S.A. These falls represent a total energy of 826,000 h.p. in the summer, and 1,068,000 h.p. in the winter. The distance from the falls to Madrid and Bilbao is only 260 and 330 km., respectively, that is to say, well within the limits of useful transmission of power.

The article contains a list of important electrical schemes carried out during the year, including hydro-electric works, transmission systems, the extension of steam stations, electric railway construction and the electrification of existing lines, the installation of automatic telephones in a number of towns, and the establishment of radio services between Spain and America.

Meter Approved.

The Electricity Commissioners have approved of the construction and pattern of the Metropolitan-Vickers Type N.E. polyphase watt-hour meter, rated sizes 2½, 5, 10, and 20 amps., 100, 200, 240, and 400 V, at 40, 50, 80, and 100 cycles per second and 240 V at 25 and 39 cycles per second.

German Foreign Electrical Trade.

The imports of electrical machinery and apparatus into Germany during the eleven months ended with November last attained a value of £2,338,150, as compared with £2,012,750 in the corresponding period of 1928. The exports of similar material from Germany during the same period advanced from £22,271,450 to £26,396,350.

German Cable Syndicates.

It is announced that the agreement binding the members of the German High and Low-Pressure Cable Syndicate, which would have lapsed at the end of March, has now been prolonged for four years. In principle the members of the Conductor Wire Syndicate, which would have expired also at the close of March, have agreed to an extension. Efforts are being continued to fix quotas for the individual members, and it is said that the large outside works (A.E.G., Siemens, Bergmann and Brown-Boveri), which have hitherto stood aloof from the syndicate, have held out the prospect of joining it, if this can be arranged.

A New Dutch Cable Factory.

A scheme is approaching completion for the establishment of a new cable factory in Holland at the now idle spinning mills at Haaksbergen. The name of the new undertaking is the Twentsche Kabelfabriek, the share capital is 1,000,000 fl., and participations have been taken by a number of business men in Twente, North Brabant and Drente. The new factory, which will produce h.p. cables, is expected to be put into operation shortly.

Wages in the Cable-making Industry.

The Joint Industrial Council for the Electrical Cable-Making Industry informs us that there will be no "cost-of-living" change in wages on the third pay day in March.

An Italian Cable-selling Company.

Six of the principal cable manufacturing concerns in Italy have organised a joint selling company—La Società per il Commercio dei Conduttori Elettrici ed Affine "Selco"—with a capital of about £107,500 and headquarters in Milan.

New Italian Companies.

Among the new companies recently formed in connection with electricity supply in Italy are the Società Impianti Idroelettrica Ponte S. Marco, Brescia, capital 1,500,000 lire; La Società Elettrica del Tenga, Campagna, capital 2,000,000 lire, to establish a hydro-electric station on the River Tenga; and La Società Idroelettrica Cimena, Turin, capital 300,000 lire.

Engineering Works Closed.

In spite of representations made by the local authority the directors of the English Steel Corporation, Ltd., are adhering to their decision to close the Penistone steel works of Cammell, Laird & Co., Ltd. Some of the employés have been absorbed in other works but about 1,000 remain unemployed.

Another engineering works which is to be closed indefinitely is that of Messrs. Richardsons, Westgarth & Co., Ltd., at Middlesbrough. This means the displacement of between 400 and 500 workers. The reason for the step is given as trade depression.

New French Companies.

La Société Hydroelectriques des Cevennes is the name of a company which has been formed in Paris (28, Rue de Liége), with a capital of 3,000,000 fr., to acquire and develop steam and hydro-electric generating stations.

A new company has been formed at Thiers (Puy-de-Dôme), with a capital of six million francs and the title La Société des Forces Motrices du Couzon, to establish a new hydro-electric power station on the River Couzon in the Puy-de-Dôme Department.

New Indian Company.

The Bombay Suburban Electric Supply Co. is the name of a new concern which has been formed in Bombay (Killick Building, Horne Street, Fort) with a capital of 50,00,000 rupees.

New Belgian Companies.

Among the companies recently organised in Belgium are the Compagnie Belge d'Accumulateurs "Cebea" (250-252, Rue Bollinckx, Brussels), capital 2,500,000 fr.; and the Compagnie Générale Belge des Isolants, Brussels. The last-mentioned concern has been organised to take over the sale of the insulating products of the Société La Forvillatte, of Loth, the Société La Plastisola, of Droogenbosch, and the insulating material department of the Société des Ateliers de Constructions Electriques de Charleroi.

A company has lately been formed in Brussels (58, Avenue de Tervueren, Etterbeck) with the title of La Société Belge de Traction Electrique par Accumulators. Several electricity supply concerns are interested in the new undertaking, the object of which is to popularise the use of electric vehicles in Belgium.

The Belgian Electrical Industry.

The directors of the Banque de Bruxelles, in the course of their annual report for 1929, state that discussions are proceeding between different trusts of electrical undertakings and important financial groups, of which the bank forms part, with a view to the "establishment of an atmosphere of general understanding in the domain of electricity." In the opinion of the directors, the successful conclusion of the negotiations will be highly profitable to the Belgian electrical industry, in which the bank is largely interested. The report proceeds to state that during last year the bank participated in various new electrical groups, of which brief information is given.

Bankruptcy Proceedings.

RACHEL SHEECHMAN, dealer in wireless instruments, gramophones, &c., 107, Devons Road, Bow, E.—A sitting of the London Bankruptcy Court was appointed to be held on February 18th before Mr. Registrar Mellor for the public examination of this debtor, who failed last October on the petition of a creditor. Mr. Armstrong, Assistant Official Receiver, reported that on December 3rd the Court ordered the debtor to file a statement of her affairs within fourteen days, and a further order was made on January 21st for the statement to be lodged in seven days. The order had not been complied with, although the bankrupt had been written to several times by the Official Receiver with reference thereto. In the absence of the debtor the examination was adjourned *sine die*.

J. A. CANE, T. P. CANE, and D. R. CANE (Cane Bros.), consulting and electrical engineers, Sturry, Kent.—Receiving order made January 28th, on a creditor's petition.

T. W. HALEY, plumber and electrician, 105, West Street, Leeds.—First meeting, February 28th, at the Official Receiver's office, 24, Lower Bond Street, Leeds. Public examination, April 1st, at the County Court House, Leeds.

H. G. EDGHILL, electrical and wireless engineer, 13, Wembley Hill Road, Wembley.—First meeting held February 26th, at 29, Russell Square, W.C. Public examination, March 12th, at the Court House, St. Albans.

E. W. KIRK (Ace Radio Manufacturing Co.), wireless apparatus maker, 26, Curzon Street, Derby.—Trustee, Mr. L. A. West,

Official Receiver, 22, Regent Street, Park Row, Nottingham, released February 7th.

E. A. WARNES (Victoria Radio Co. and E. A. Warnes and Co.), electrical and radio engineer, 10, Crescent Gate, Wilmstow Road, Rusholme, Manchester.—First and final dividend of 1s. 6d. in the pound payable at the offices of the trustee, Mr. A. T. Eaves, 47, Mosley Street, Manchester.

A. P. GODDARD, electrician, 25, Silver Street, Doncaster.—Receiving order made February 18th, on debtor's own petition.

J. H. JACKSON, electrical engineer, Dock House, Winsford.—First meeting, February 28th, at the Official Receiver's office, 12, Lonsdale Street, Stoke-on-Trent. Public examination, March 20th, at the Petty Sessional Court House, Crewe.

W. H. LAURENS, radio engineer, 492, Prescot Road, Old Swan, Liverpool.—Trustee, Mr. J. Allcorn, Official Receiver, Government Buildings, Victoria Street, Liverpool, released February 7th.

Company Liquidations.

CLEETHORPES RADIO SUPPLY, LTD.—Winding up voluntarily. Liquidator, Mr. A. J. Weaver, 77, Victoria Street, Grimsby.

STANDARD ELECTRIC CO., LTD.—A meeting of creditors is called for March 11th at 190, West George Street, Glasgow, for the purpose of considering, and if thought fit, appointing a liquidator and a committee of inspection.

DONARELLI PHONO-ELECTRON, LTD.—A meeting of members is called for March 20th, at the offices of Messrs. Egerton Chater & Co., 74, Cheapside, E.C., to hear an account of the winding up from the liquidator, Mr. H. H. Gay.

ARTANDIA, LTD.—First meeting of creditors and contributories, February 28th, at Carey Street, W.C.

NORTH SURREY ELECTRICAL FACTORS, LTD.—A meeting of creditors was held at the Greyhound Hotel, Croydon, on February 26th.

STEREOSCOPIC X-RAYS, LTD.—A meeting of members is called for March 24th at the offices of Messrs. Viney, Price & Goodyear, Empire House, St. Martin's-le-Grand, E.C.1, to hear an account of the winding up from the liquidator, Mr. F. W. Le B. Lean.

Private Arrangements.

HALCYON WIRELESS CO., LTD., 313, Regent Street, W., radio manufacturers.—A meeting of creditors was held at the above address on February 20th, when the chair was taken by Mr. Gisburne, representing the Six-Sixty Radio Company, the largest trade creditors. A committee of four of the principal creditors had stated that as a result of certain proposals there was every hope that a scheme could be formulated which would result in a substantial payment being made to the creditors. The chairman said that a petition had been presented for the compulsory winding up of the company by Messrs. Bullmores, Ltd., and it was suggested that the creditors should support the application for the adjournment of the petition for one month so that definite proposals might be laid before the creditors. An accountant gave figures showing the position as at January 31st last. He stated that the assets totalled roundly £25,000, and these were subject to a debenture which was held by the bank and covered an overdraft for £5,000. The claims of sundry creditors were £28,211 and there had been a loss on trading to date of £10,588. The capital of the company was £2,000 in fully paid shares. A director of the company stated that the stock was in a saleable condition. It was agreed that the time asked for should be granted the company and that the committee should be authorised to support the adjournment of the petition.

SYMPHONY GRAMOPHONE & RADIO CO., LTD.—A meeting of the unsecured creditors has been called for to-day (Friday) at Winchester House, E.C.2, for the purpose of considering a scheme of arrangement.

Winding-up Petitions.

WYNSOR ELECTRIC RANGE CO., LTD.—A petition for the winding up of this company has been presented to the High Court by Mr. W. D. Stevens, engineer, 121, Cazenove Road, Stamford Hill, N., creditor, and will be heard in London on March 3rd.

MAYFIELD ELECTRIC GRAMOPHONES, LTD.—A petition for the winding up of this company has been presented to the High Court by Messrs. G. L. Scott & Co., Ltd., creditors, and will be heard in London on March 3rd.

Dissolution of Partnership.

D.C. ELECTRIC CO., electrical and radio engineers, &c., Higher Cheap Street, Sherbourne, Dorset.—Mr. J. Dootson and Mr. W. F. Cobb have dissolved partnership. Mr. Dootson will attend to debts.

Estonian Foreign Electrical Trade.

According to the *Board of Trade Journal*, the imports into Estonia last year of "electrical machines, apparatus and implements" were valued at 2,519,700 kr. (£138,000) as compared with 1,834,200 kr. (£100,000) in 1928. Exports of the same class had a value of 395,300 kr. (£22,000) against 463,400 kr. (£25,000).

Polish Electrical Imports and Exports.

The imports of "conductors, apparatus and other electrotechnical materials" into Poland during December last were valued at 7,547,000 zloty (£174 000), while exports of these goods were put at 238,000 zl. (£5,500).

Iraq Customs Duties.

The *Board of Trade Journal* reproduces a list of articles the duties upon which have been altered by the Iraq authorities. Among the goods affected are lamp-shades, electric torches and their batteries, electric radiators, vacuum cleaners, irons, kettles, toasters and heating plates, and fittings for these articles, which are now subject to an *ad valorem* duty of 15 per cent.

Employment during January.

The February *Ministry of Labour Gazette* states that employment in the engineering industry during January was bad on the whole and showed a general decline as compared with the preceding month. In electrical engineering it declined to fair, although there was little change as compared with January, 1929. In the engineering industry as a whole the number of unemployed increased by 10,814 to 101,732, the proportion rising from 9.1 to 10.1 per cent. The number of unemployed in the electrical engineering branch rose to 4,425, increasing the percentage from 4.2 to 5.2. In the electric cable, wire and lamp manufacturing group the number was 6,060, the proportion thus rising from 4.5 to 6.4 per cent. There was also an increase in unemployment in the electrical wiring and contracting industry—from 5.7 to 7.5 per cent.—the total being 1,244.

Unemployment.

The number of registered unemployed increased by 11,402 during the week ended February 10th, at which date the total was 1,520,000, as compared with 1,508,598 on February 3rd, and 1,342,505 on February 11th, 1929.

The Chloride Works Committee.

We have received from the CHLORIDE ELECTRICAL STORAGE CO., LTD., a copy of the twelfth annual report (for 1929) of its Works Committee. This records activity in a number of directions affecting the welfare of the company's employés. Among other matters, the Committee advised the board upon the company's pensions scheme, it supervised the working of the canteen, administered funds in aid of distressed employés, and in many other ways assisted the company in maintaining harmony and goodwill throughout its works.

The British Exhibition in Argentina.

The Argentine Government has decided to grant facilities to goods destined for the British Exhibition to be held in Buenos Aires in February, 1931, according to an Associated Press dispatch from Buenos Aires. The Custom House will admit such goods duty free provided they are re-embarked within six months. They will be imported under an arrangement with the British Chamber of Commerce, which has undertaken to give a minute description of the goods to be shown at the exhibition.—*Reuter* (New York).

An E.D.A. Sales Conference.

A lecture on "Personal Salesmanship in the Electrical Industry" was given by Miss Gladys Burlton, B.A., at the Manchester Lighting Service Bureau on February 19th, it being the fourth of the current series of E.D.A. Sales Conferences (North-Western area). The chair was taken by Mr. H. C. Lamb. Miss Burlton said that there was no scientific method which could be applied to salesmanship. It was important to make the commodity appreciated, and there was a danger with electrical goods of becoming too technical. Customers did not want to know about "amps" and "juice," &c. It was much more effective to make clear to them just what electricity would do in a practical manner, and just what it would cost them to "plug into comfort."

The Sydney Bribery Charges.

Reuter reports that Messrs. Babcock & Wilcox, Ltd., have paid over £10,600 to the Sydney Corporation. This is the sequel to the charges of bribery made against an Australian agent of the company in connection with power plant contracts for the City Council, when the company was ordered to refund the amount involved.

Central Electricity Board Contracts.

The Central Electricity Board has placed contracts to an approximate total value of £230,000 in connection with the Mid-East England Electricity Scheme, as follows: For 33-kV transmission lines, Messrs. Johnson & Phillips, Ltd.; for 132-kV transformers, the English Electric Co., Ltd. The contract for transformers is additional to those reported in our last issue.

Book Notices.

"*Journal* of the Institution of Electrical Engineers." Vol. LXVIII. February, 1930. London: E. & F. N. Spon, Ltd. Price 10s. 6d.

"Economic Conditions in Venezuela" (November, 1929), by Mr. R. J. Kirwin, acting British Consul at Caracas. Published by the Stationery Office for the Department of Over-

seas Trade. Price 9d. net.—This report briefly reviews the trade of the country and includes a useful commercial summary.

Government Department Electrical Specifications—No. 12, 1929. "Electric Cables, H.P. and L.P. Cables (paper insulated for electric power and light)." H.M. Stationery Office, price 6d. net.

New Catalogues and Lists.

Messrs. FERRANTI, LTD., Hollinwood, Lancs.—A showcard illustrating the company's a.c. mains radio receiver.

Messrs. WOLF & MORGAN, LTD., 66, Victoria Street, S.W.1. —A price list of "Wagner" motors.

Messrs. WATSON & SONS (ELECTRO-MEDICAL), LTD., 43-47, Parker Street, Kingsway, W.C.2.—An illustrated brochure describing the company's X-ray couches, screening stands, tube stands, &c. Also a leaflet dealing with the "Sunic" surgical diathermy apparatus.

Mr. L. WILKINSON, 8, City Road, Finsbury Square, E.C.1. —Leaflet No. 11 containing illustrated particulars and prices of "Wilco" motors, dynamos and shocking coils.

ELECTRICAL EQUIPMENT & CARBON CO., LTD., 107-111, New Oxford Street, W.C.1.—An illustrated and priced leaflet advertising the "Megometer" insulation testing set.

IGRANIC ELECTRIC CO., LTD., 149, Queen Victoria Street, E.C.4.—Publications No. 6648 and 6655, dealing, respectively, with the "Phonomotor" induction motor, and the company's "A.C.2" radio receiver.

Messrs. G. A. HARVEY & Co. (LONDON), LTD., Greenwich Metal Works, Woolwich Road, S.E.7.—The first number of the "Harco Magazine" contains, in addition to many notes on the company's social activities, several interesting articles.

Messrs. CROMPTON PARKINSON, LTD., Guiseley.—A pamphlet describing the "Klosd" motor, with illustrations showing installations carried out by the company.

SWITCHGEAR & COWANS, LTD., Elsinore Road, Old Trafford, Manchester.—Catalogue section No 23, containing illustrations and particulars of metal-clad, compound-filled internal isolation switchgear.

SYNCHROMATIC TIME RECORDING CO., LTD., Victoria Buildings, South Castle Street, Liverpool.—A circular drawing attention to "Synchromatic" time recorders.

FRANCIS LAMP LOCKS, LTD., 2, 3, & 4, Cockspur Street, S.W.1.—A folder giving particulars of the company's Bakelite lamp lock.

Messrs. SIMON-CARVES, LTD., 20, Mount Street, Manchester. —An illustrated brochure, being a reprint of an article from the ELECTRICAL REVIEW, describing the boilers and pulverised fuel plant installed by the company at the Birmingham Corporation Electricity Works, Nechells.

DUSSEK BITUMEN CO., LTD., Empress Wharf, Sherman Street, Bromley-by-Bow, E.3.—A well-produced and illustrated brochure giving particulars of "Trinidite" insulating compounds.

WARDLE ENGINEERING CO., LTD., Elsinore Road, Old Trafford, Manchester.—Publication No. L.552, containing particulars, illustrations, prices, &c., of industrial lighting equipment, including "Workslite" reflectors, girder fittings, "Prismat" fittings, &c.

REVO ELECTRIC CO., LTD., Tipton, Staffs.—List No. 163, giving illustrations and particulars of the "Sovereign" electric iron. Priced. Also an illustrated leaflet dealing with "Revo" street lighting fittings.

BULPITT & SONS, LTD., Swansea Works, Birmingham.—An illustrated booklet dealing with "Swan Brand" electric cooking utensils.

Messrs. W. E. BEARDSALL & Co., LTD., Victoria Bridge, Manchester.—An illustrated leaflet drawing attention to the "Xtra-point" lampholder and plug.

STERNOL, LTD., Royal London House, Finsbury Square, E.C.2.—Two folders dealing with the company's lubricants, with particular reference to "Cooloricid."

Messrs. W. T. HENLEY'S TELEGRAPH WORKS CO., LTD., Holborn Viaduct, E.C.1.—Illustrated list No. W.B.4, describing the company's link disconnecting boxes, together with a price list.

GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2.—An illustrated booklet drawing attention to the "Lecco" stimulator.

Trade Announcements.

The Leeds branch of Tungsram Electric Lamp Works (Great Britain), Ltd., has been moved to larger premises at Britannia House, 74, Wellington Street, Leeds.

CENTURY LAMPS (LONDON), LTD., has removed to 6, "O" Building, 89, Upper Thames Street, E.C.4. (Telephone: Mansion House 5020.)

Mr. A. B. BLAKEY, electrical engineer and manufacturers' agent has removed from Birmingham to 4, Courtenay Place, Teignmouth; he asks for manufacturers' lists, &c.

The office of the BRITISH ELECTRIC TRANSFORMER CO. (AUST.) PTY., LTD., has been moved to the corner of Coventry and Dodd Streets, South Melbourne, S.C.4, Victoria, Australia.

On March 3rd, the LANCASHIRE ELECTRIC POWER CO., is removing from 196, Deansgate, Manchester, to National Buildings, St. Mary's Parsonage, Manchester. (Telephone No.: Central 6595.)

Mr. J. BECKETT, electrician and radio dealer, has opened premises at 60, Roper Street, Whitehaven.

Recent Contracts.

The ENGLISH ELECTRIC CO., LTD., has recently received three further orders for electric trolley 'buses. For Pontypridd the order is for seven single-deck saloon type vehicles mounted on 3-axle type chassis; each 'bus will have seating capacity for 32 passengers. The equipment will consist of a DK.121 60-h.p. motor fitted with roller bearings and an "English Electric" contactor type foot-operated controller. To Southend Corporation the company is supplying two double-deck top-covered trolley 'buses mounted on 3-axle type chassis with air brakes operating on all wheels. Each vehicle will have seating accommodation for 59 passengers. Special features of the body are the inclusion of an extra exit on the near side front and the low loading whereby passengers may enter direct to the platform without any step arrangement. The equipment will consist of an "English Electric" DK.122 twin-type 80-h.p. motor, fitted with roller bearings and a contactor type foot-operated controller. An order from Christchurch, New Zealand, is for six complete 3-axle trolley 'bus chassis and equipments.

Messrs. BOVING & Co., LTD., have received an order from the Mount Lyell Mining and Railway Co., Ltd., Tasmania, for a spiral encased turbine with an output of 2,800 b.h.p. on a head of 375 ft. at 750 r.p.m. This turbine is for the Yolande River scheme and is specially interesting in that it is completely automatic and is equipped with protective devices.

In addition to the contract placed with Messrs. JOHNSON AND PHILLIPS, LTD., by the Central Electricity Board (mentioned on p. 393), the following contracts have recently been received by the company:—From the County of London Electric Supply Co., Ltd., for 11,000-V overhead power lines for the rural development of Kent. (This work will, it is estimated, take at least three years to complete). From the Hartley Main Colliery Co., Ltd., for underground cables, power station and sub-station switchgear, and transformers for a new colliery power scheme; the total amount involved is some £40,000. The General Post Office has ordered trunk telephone cables between Birmingham and Wolverhampton, and Oxford and Banbury.

Social Events.

The annual dance of the Scottish Central Electric Power Company, Operating Staff Department, took place recently at Larbert. Mr. J. Cargill, B.Sc., superintendent engineer, Mr. Carson, resident engineer, and Mr. Sherrington (Messrs. Balfour, Beatty & Co.) were present.

The staff of Messrs. Wood & Cairns, Ltd., Argyll House, 11, Queen Street, Edinburgh, recently held their annual whist drive and dance at Windsor House. The company numbered about one hundred, and a very enjoyable evening was spent.

For Sale.

The Estate Agent, Cowdray Estate Office, Midhurst, Sussex, invites offers for the purchase of two suction gas engines, each 65 b.h.p., direct-coupled to 30-kW generators, two gas plants, each of 60-b.h.. capacity, one four-panel switchboard, and one storage battery of 55 cells, 1,600 ampere-hour capacity. The Salisbury Electric Light and Supply Co., Ltd., has for disposal a quantity of generating plant, including four Belliss condensing engines, each coupled to dynamos with a capacity of 90, 100, 180 and 200 kW respectively. Messrs. Ramsomes, Sims and Jefferies invite offers for automatic switches, switchboards, portable induction motor, &c. The Sheffield Corporation Electric Supply Department has for disposal, boiler and generating plant, now out of commission, at Kelham Island generating station. (See our advertisement pages to-day.)

The Leipzig Spring Fair.

Many special privileges and fare reductions are granted by British and German railway companies and steamship services to visitors to the Leipzig Spring Fair, the Engineering and Building Section of which is being held from March 2nd to 12th. Full details and booklets regarding these privileges can be obtained from the London office of the Fair, 1, Gower Street, W.C.1.

Prices of Raw Materials.

Messrs. F. Smith & Co. report, February 25th:—Copper (electrolytic) bars: £84 7s. 6d., 2s. 6d. increase; ditto ditto sheets, no change; ditto ditto wire rods: £94 7s. 6d., 2s. 6d. increase; ditto ditto h.c. wire, no change.

Messrs. James & Shakespeare report, February 25th:—No change in copper prices. English pig lead: £21 15s., 25s. decrease.

Messrs. Edward Till & Co. report, February 25th:—India-rubber, para fine: 8½d., ¼d. decrease.

In their letter of February 22nd, Messrs. James Forster and Co. stated that the lead market opened last week in the same stagnant state as has been the case for weeks past, prices being still under control, but on Wednesday and Thursday values broke sharply on heavy selling of forward lead evidently for American account. On Friday prices recovered somewhat, but the market closed in a disturbed condition with sellers predominating. That the producers' price will have to be reduced is certain, but they may make fresh attempts to stabilise prices at a lower level.

Lighting and Power Notes.

Bedford.—LOAN SANCTIONED.—The Corporation Electricity Committee has obtained sanction to a loan of £20,000 for services.

Berkswell.—ELECTRICITY SUPPLY.—An agreement has been made between the Coventry and Birmingham Corporations for a supply of electricity to Berkswell. The Coventry Electric Supply Department has received applications for supply, but the Corporation's mains cannot at present be economically extended to Berkswell, and the Birmingham Corporation, whose mains are more conveniently situated, will supply electricity on condition that Coventry bears the cost of connection and distribution, lays the service cables and installs meters, renders accounts, collects the money and pays to Birmingham 60 per cent. of it. The arrangement will continue until Coventry is in a position to provide a direct supply.

Birkenhead.—INAUGURATION OF SUPPLY.—The Corporation is to inaugurate the electricity supply to Burton and Puddington to-morrow, March 1st. The official switching-on ceremony will be performed at the Burton out-door sub-station, Dunstan Lane. An exhibition of electrical apparatus has been arranged in the Gladstone Hall, Burton Village.

Blairgowrie.—INAUGURATION OF SUPPLY.—The electricity supply from the Grampians Electricity Supply Company's power scheme was inaugurated on February 18th.

Brighton.—ELECTRICITY SUPPLY EXTENSIONS.—The Corporation Lighting Committee has decided to erect a sub-station at Warren Farm and lay a ring main extension to Rottingdean at a cost of £12,433. The Committee is also to lay a new feeder from the Lewes Road station at a cost of £3,300.

Bury.—POWER STATION EXTENSIONS.—The Corporation Electricity Committee, which has just obtained sanction to a loan of £6,660 for new power station plant, has had under consideration a recommendation of the electrical engineer that new h.p. switchgear should be installed at the central power station, at a cost of £27,000 including the provision of the building to house the plant. A recommendation to this effect is to be placed before the Town Council.

Canada.—HYDRO-ELECTRIC PROGRESS.—The Dominion Water Power and Reclamation Service of the Department of the Interior of Canada, Ottawa, in its annual review, states that the total water-power resources of the Dominion are now estimated to be 20,347,400 h.p. under conditions of ordinary minimum flow, or 33,617,200 h.p. ordinarily available for six months of the year. The total hydraulic development at the present time is represented by a turbine installation of 5,727,162 h.p., being an increase of about 378,000 h.p. during the past year.

THE TORONTO HYDRO-ELECTRIC SYSTEM.—The report of the Toronto Electricity Commissioners on the working of the hydro-electric system for the year ended December 31st last, shows a gross income, including appliance sales, of $11,083,883, as compared with $10,380,960 in the preceding year. Working expenses, including purchase of electrical energy from the Hydro-electric Commission of Ontario, and Appliance Department costs, were $7,809,639, as against $7,554,927, leaving a gross profit of $3,274,244 ($2,826,033). From this the following charges had to be met: Interest on loans, $1,305,965; depreciation, $610,890; taxes, $28,794; fixed charges *re* York Township, $110,000; sinking funds, $329,862; and redemption funds, $577,045. There was a net surplus of $311,688, as compared with $39,273 in 1927. The sales of electrical energy increased from 603,626,754 to 675,026,262 kWh, and the maximum supply demanded from 238,849 to 259,579 h.p.

Chester.—LOANS.—The Corporation Electricity Committee recommends that application be made for sanction to loans of £30,000 for overhead lines, and £20,000 for underground cables.

Colchester.—MAINS EXTENSIONS.—Subject to government assistance, the Corporation Electricity Committee recommends the completion of the outer ring main within the borough, and the extension of mains from Eight Ash Green to Marks Tey *via* Gallows Green, from Thorpe-le-Soken *via* Weeley to Tendring, from Riddleswood *via* Ainger's Green to Great Bentley, and from Ardleigh to Dedham and Dedham Heath.

Continental.—GERMANY.—According to the *E.T.Z.*, the output of the 122 principal electric power stations in Germany during November last amounted to 1,574,000,000 kWh, bringing up the total for the first eleven months of the year to 15,327,800,000 kWh, as compared with 12,975,000,000 kWh in the corresponding period of 1928.

ITALY.—La Societa Idroelettrica des Cismon has recently secured a concession to establish an 18,450-h.p. hydro-electric station to utilise the power of the Cismon river, near Sovramonde.

Darlington.—ELECTRICITY CHARGES REBATE.—The Corporation Electricity Committee recommends a rebate to all electricity consumers in the borough of 10 per cent. off the accounts for the quarter ending March 31st next.

Glasgow.—PROGRESS DURING JANUARY.—Under the Corporation Electricity Department's scheme, 854 houses were wired in January making a total to date of 20,295, while hired appliances numbered 146, bringing the total to 20,113.

CHANGE OF FREQUENCY.—The Corporation Electricity Committee has instructed the manager to proceed with the general preliminaries in connection with the change of frequency of the electricity supply in the north and south central districts of the city and to submit a report on the details of the work involved.

MAINS EXTENSIONS.—The Committee has approved the extension of the distributing mains at a cost of £3,172.

Highworth.—ELECTRICITY SUPPLY.—At a recent meeting of the Swindon and Highworth Rural District Council it was stated that the Electricity Commissioners had written to the Wessex Electricity Company asking it to proceed as quickly as possible with the Highworth electricity supply scheme.

Irish Free State.—THE SHANNON SCHEME.—The electricity supply was switched on recently at Drogheda and it is hoped that Sligo will also be connected very shortly.

Leicester.—LOAN.—The Corporation Electricity Committee is to seek sanction to the borrowing of £150,000 for mains and services.

Leyton.—NEW FEEDERS.—The Corporation Electric Lighting and Tramways Committee recommends that sanction be obtained to the borrowing of £6,000 for the purpose of providing additional a.c. feeders from the Forest sub-station to Whipps Cross sub-station, and between Waterloo Road and the Leyton Green sub-station.

London.—STOKE NEWINGTON.—The Borough Council has received sanction to the borrowing of £5,000 for free wiring installations. Application is to be made for sanction to loans of £10,000 for mains and services, and £5,000 for meters.

ISLINGTON.—In order to continue without interruption the work of replacing h.p. and l.p. rubber-insulated mains which has been in operation since 1925, the Borough Council Electricity Committee has voted an estimate of £19,050 for work to be done during the year.

BATTERSEA.—The Borough Council Electricity Committee recommends mains extensions as follows: (*a*) Services to 91 premises, £903; (*b*) mains for private services, £1,936; (*c*) public lighting and conversion of gas lamps, £166; (*d*) replacement with armoured cable of old vulcanised bitumen distributors, £2,134.

The Borough Council Baths Committee has voted £10,650 for constructing the boiler house and installing therein two boilers, economiser, water softening plant, boiler feed pumps, and other auxiliary plant at the Nine Elms baths.

WANDSWORTH.—The Highways Committee of the Borough Council reports that it has considered the question of improving street lighting throughout the borough and now has accepted an offer by the County of London Electric Supply Co., Ltd., to demonstrate modern street lighting by electricity, on the understanding that the Council is put to no expense in the matter. The installation of the experimental gas lamps by the respective gas companies is now nearing completion, and demonstration lamps are being erected at various places.

ST. PANCRAS.—The Borough Council Electricity and Public Lighting Committee recommends the laying of an additional l.p. feeder from Highgate Road sub-station along Mansfield Road to Heriot Place, at an estimated cost of £2,680, and the extension of mains in Rothwell Street, St. Paul's Road, Millman Street and Taviton Street at an estimated cost of £739. The Committee also recommends the laying of cables between King's Road power station and Arlington Road sub-station, at an estimated cost of £6,480, this being £1,980 more than the figure given in the original estimate, owing to an alteration in the site of the sub-station.

HAMMERSMITH.—The Borough Council Electricity Committee recommends that application be made to the London County Council for consent to the raising of the pressure of supply, which is at present 110 V and 220 V, to the standard pressure of 230 V.

PRICE REDUCTION.—The South London Electric Supply Corporation, Ltd., has reduced its lighting flat rate from 5½d. to 5d. per kWh.

Minehead.—NEW PLANT INAUGURATED.—The chairman of the Urban District Council, Mr. J. A. C. Kennard, started up the new 500-h.p. set at the Minehead power station on February 19th. This is part of the plant necessitated by the increased demand for electricity and the change-over from d.c. to a.c. Mr. Selwyn Grant, general manager of Whitehall Securities Corporation, Ltd., and chairman of the Minehead Electric Supply Co., Ltd., said that the consumption per head in that area had increased during the last five years by 76 per cent., and it was not expected that even the present addition to the plant would tide them over more than a short while.

Nairn.—ELECTRICITY SUPPLY.—The Town Council is negotiating with Messrs. Johnson & Phillips, Ltd., for the provision of an electricity supply in the town.

Newent.—SPECIAL ORDER.—The Shropshire, Worcestershire, and Staffordshire Electric Power Company has applied to the Electricity Commissioners for a Special Order authorising it to supply electricity in the rural district of Newent.

Oswestry.—LOAN.—The Town Council has decided to apply for sanction to the borrowing of £6,500 for the purpose of meeting the demands on the undertaking during next winter and to commence the changing-over of the supply from d.c. to a.c.

Paisley.—ELECTRICITY SUPPLY SCHEME.—The Corporation electrical engineer has prepared a scheme for the improvement of the electricity supply in the east end of the town at a cost of £9,827.

Southend-on-Sea.—ELECTRICAL PLANT DANGERS.—At a recent meeting of the Town Council a report of the Chief Inspector of Factories was read on the condition of the Corporation's generating plant. One engine, it was stated, had run 6,500 hours without overhaul, and that unless a complete overhaul was made mechanical dangers and risks of an explosion in the crank chamber were likely to occur. Another engine had a bent crankshaft and knocked in three places. A third engine also knocked in three places. The engine at the Leigh sub-station had already broken two pistons, and was likely to break again. This would involve a general breakdown, with serious consequences. Two engines at the Thorpe Bay sub-station were stated to hold risks of injury to the engineers. The risks entailed, the inspector considered, were unwarranted, and he asked when an overhaul could be started. The Corporation replied that it had been refused permission by the Electricity Commissioners to buy the necessary additional machinery.

United States.—ELECTRICITY SUPPLY PROGRESS.—During 1929 the International Hydro-Electric System produced 3,840,565,000 kWh of electrical energy, which is 44 per cent. greater than the output in 1928, and two and one-third times that in 1927. In December the output was 345,384,000 kWh, 19 per cent. greater than in December, 1928, and 70 per cent. greater than in December, 1927.

ELECTRICAL DEVELOPMENTS.—According to *Power*, plans for enlarging the State Line generating station, on Lake Michigan, have just been announced, to the effect that two new turbo-generators are to be installed. In conjunction with the initial 208,000 kW unit that went into operation last summer, they will give a total generating capacity of 483,000 kW. Construction of a 35,000-kW steam generating plant at an estimated cost of $3,500,000 by the San Joaquin Light & Power Corporation, Fresno, Calif., was announced recently. Work will start by March 1st and the schedule calls for completion of the project by June, 1931. The completion is announced of a tentative draft of the final plans for the development of the hydro-electric site at Kettle Falls on the Columbia River in north-eastern Washington and the filing of these plans with the Federal Power Commission with the application for the issuance of a license. The development is planned in ten stages, with a 35,000-h.p. initial installation and an ultimate development of about 240,000 h.p.

ACQUISITION OF CANADIAN COMPANIES.—The Central States Power & Light Company, a public utility concern serving nearly 200 cities and communities in the Middle-West of the United States, has acquired ownership of two well-known Canadian electric power and gas companies, the Canada Electric Co., Ltd., and the Eastern Electric & Development Co., Ltd., which serve extensive industrial and mining districts in Nova Scotia and New Brunswick.

Walton-on-Thames.—ELECTRICAL SHOWROOM.—The Urban District Council has applied for sanction to a loan of £3,500 for mains and services. It is proposed to establish a permanent showroom and offices in connection with the undertaking.

Tramway and Railway Notes.

Continental.—NORWAY.—Sanction has been given by the Norwegian Government to a scheme put forward by the town of Narvik for the utilisation of the Nygaards Falls to supply electrical energy for railway purposes.

ITALY.—The authorities of the North Milan Railway have decided to electrify the whole of their system, the necessary plans now only awaiting the approval of the Italian Ministry of Communications. The railway between Sondrio and Turano is also to be electrified.

Costa Rica.—RAILWAY ELECTRIFICATION.—The Government has been informed by the German contractors for the electrification of the Pacific Railway that the main work will be completed on April 1st. The line, which is State-owned, runs from San José to Puntarenas (a port on the Gulf of Nicoya), and is 69 miles long, with three short branches: Roble to Esparta, Cirurelas to Alajuela and San José to the junction with the Northern Railway. It is proposed, after April 1st to double the number of daily trains running on the main line, and the journey, now taking 6 hours, will be reduced to 4½ hours. The electrical equipment of the San José repair-shops will be increased, and also the machinery for the wood-working shop. Purchases are made by the Administrador-General with the consent of the Consejo Administrativo. —*Reuter's Trade Service.* (San José).

East Ham.—NEW TRAMCARS.—The Corporation Tramways Committee has decided to purchase four new tramcars at a cost of £9,700.

Leeds.—TRAMCAR REPLACEMENT SCHEME OPPOSED.—The Unemployment Grants Committee has declined to grant aid to the Corporation in its scheme for the building of 150 new electric tramcars to replace old cars, and it is probable that the scheme will be considerably modified and consideration given to the provision of more motor-'buses instead of electric tramcars. The cost of the cars was estimated at £348,000, of which £235,000 was labour charges, towards which a State grant was anticipated. The Unemployment Grants Committee has rejected the application because it is not satisfied that the scheme would provide definite relief for local unemployment.

Preston.—RAILLESS CARS.—The Corporation tramway engineer has been instructed to submit a report as to the cost of installing a system of railless cars.

Rawtenstall.—PROPOSED TRAMWAY ABANDONMENT. — The meeting between representatives of the Rawtenstall and Accrington Corporation Tramway Committees, which was to have been held on April 1st next to consider the replacement of the tramway service between the towns by 'buses, has been postponed to May 1st.

Southend-on-Sea.—RAILLESS CARS.—The Town Council has received sanction to loans of £4,700 for two railless cars, and £2,700 for cables, &c., in connection with the railless-car system.

L.M. and S. Railway.—YEAR'S WORKING.—The report of the London Midland & Scottish Railway Company for the year ended December 31st last shows that the electrical energy supplied for traction purposes amounted to 95,929,113 kWh, as compared with 92,350,300 kWh in the preceding year. Electricity supplied for power increased from 16,651,636 to 16,840,527 kWh, while energy utilised for lighting fell from 8,605,395 to 8,599,083 kWh. The supplies of electricity given to other consumers rose from 929,633 to 1,071,348 kWh. The total mileage run by electric trains was 6,380,875 as against 6,285,509 in 1928.

Southern Railway.—ELECTRIFICATION EXTENSIONS.—The report of the Southern Railway Company for 1929 states that orders have been given for the electrification of the lines from Hounslow and Twickenham to Windsor, Dartford to Gravesend, and West Croydon to Wimbledon, and it is anticipated that the new mode of traction will be brought into use during the current year. In accord with the remission of railway passenger duty, the company is to expend £2,042,560, and this will be applied in electrifying the line to Reigate, Brighton and Worthing.

Telegraph and Telephone Notes.

Australia.—TELEPHONY TO TASMANIA.—The Australian Postal Department has under consideration the advisability of establishing a telephone service between Melbourne and Tasmania by a telephone cable crossing Bass Strait. The wireless method had been agreed upon and tenders had been invited, but recent developments in submarine cable telephony have caused the Department to reconsider its decision. The distance across Bass Strait is 238 miles.

Egypt.—MOBILE WIRELESS STATIONS.—A novel use of the mobility of wireless communication is to be made by the Egyptian State Telegraph Department, which has ordered from the Marconi Company three wireless sets mounted on motor lorries for use when and where required in areas not served by the land telegraph and telephone systems, so that practically any point in a wide range of country on either side of the River Nile can be linked at short notice with the main Egyptian telegraph system. The motor lorries, also of British manufacture, will be of the six-wheel type and fitted with caterpillar track attachments, so that they will be equally mobile on hard and soft desert country. Each lorry will carry a medium-wave ½-kilowatt telephone transmitter and a small portable short-wave transmitter of 100 watts power. The aerials will be suspended from 70-ft. portable masts, and the wavelengths used will be between 600 and 2,150 metres for the medium-wave set, and from 20 to 50 metres for the short-wave set. Self-contained power plant will be provided.

Iceland.—TELEPHONY.—The Norwegian A.S. Elektrisk Bureau, whose Swedish connection is the L.M. Ericsson company, has been entrusted with the work of converting the telephone system to the automatic method. In order to get the contract, which involves about £50,000, the Norwegian company had to lend 1,000,000 kr. to the State of Iceland at 6 per cent., redeemable in 15 years, the loan having been arranged by the company's Swedish connection. All the work in connection with the execution of the contract is to be carried out in Oslo.

International Telephony.—VATICAN CITY.—A telephone service has been inaugurated between all places in Britain and the Vatican State, *via* Rome, Italy.

The Telephone Service.—PROGRESS IN YORKSHIRE.—Annual reports prepared for the Advisory Committees in the North-Eastern District, Leeds (superintending engineer, Mr. J. W. Atkinson, M.I.E.E.) indicate the progress achieved in 1929 in the undermentioned areas:—

WEST YORKSHIRE.—The number of lines increased by 1,597 to 44,271, and new stations numbered 2,772, raising the total to 68,312; some 41.8 per cent. of the lines and 42.6 per cent. of the stations were automatic. Trunk calls numbered 6,131,028 and local and junction calls totalled 41,679,826. The number of street kiosks installed during the year was 88, making a total of 596, the majority of which are now lighted electrically between sunset and sunrise. In rural areas 28 call offices were established at Post Offices and three at railway stations. Telephones were provided for 101 police boxes in Bradford and 20 boxes in Wakefield; orders were also received for their installation in 34 police boxes in Leeds and 35 in Huddersfield, all of which, it is expected, will be working shortly. The number of telegrams received by telephone was 449,411, or 4½ per cent. more than during 1928. There were 42 calls between subscribers in the West Yorkshire district and subscribers across the Atlantic during 1929. An increase of 22 per cent. in the use of the Continental service by West Yorkshire subscribers took place, the total being 2,121 calls. One automatic exchange (the first in the district) and three manual ones were opened, while 12 automatic and 5 manual exchanges were being equipped. Considerable extension of the underground cabling took place during the year.

YORK DISTRICT.—The number of telephones increased by 8.1 per cent. to 30,098, of which 6,228 were residential instruments. Some 11,495 were automatic and 18,603 manual. Total local and junction calls increased by 8.14 per cent. to 13,950,000, and trunk calls by 8.6 per cent. to 2,953,202. Telephoned telegrams were more numerous than in any previous year, having risen to 338.965, an increase of 4 per cent. The number of new exchanges opened was 10, bringing the total number in the district to 180. Rural exchanges, until early in 1929, were invariably of the manual type; but automatic equipment for serving small communities, designed on a basis which promises favourable economic results, was installed at nine of the new exchanges opened last year; two small exchanges were also converted to this type. The minimum exchange unit provides for 25 lines, and further units can be added to a maximum of 200 lines. The equipment is accommodated in simple extensible buildings of the "garage" type, and is unattended. Call offices increased by 33 per cent. to 849. The major portion of this unusual increase took place in rural areas, in which 176 call offices were opened. Some 36 street kiosks were installed during the year, making a total in the district of 146. Telephones (55) installed at rural railway stations for the use of the public as well as the railway staff continued to be extended, and during the year it became necessary to remove a well-known landmark at Selby in the shape of the pair of lattice masts, 120 ft. in height, by means of which a number of long-distance lines crossed the River Ouse immediately above the toll bridge. Alternative routes were found for some of the lines, and the remainder were accommodated in a new sub-aqueous cable laid alongside the bridge, which was originally planned for local lines only, but was modified to meet the unexpected need.

PHOTO-TELEGRAPHY.—The British Post Office announced the inauguration last week of a photo-telegraph service between London and Copenhagen, the Danish capital. The general conditions are the same as those of the Anglo-German service.

Turkey.—TELEPHONY.—The Norwegian Elektrisk Bureau is stated to have obtained a Turkish contract for the delivery of telephone apparatus valued at a few hundred thousand kronen. The payment for the apparatus is said to have been guaranteed through an English bank. Negotiations are also proceeding with regard to the delivery to Turkey of a considerable number of military telephones, representing millions of kronen.

Radio Notes.

Austria.—LICENCE TEST CASE.—Members of the Tyrol Radio Club in Innsbruck were so dissatisfied with their reception of the Ravag transmission from the Innsbruck relay station that they combined to refuse to pay their monthly dues, and forced Ravag to bring the matter before the Provincial Court at Innsbruck. The Court's decision, after considering all the evidence submitted by legal members of the Club, says *World-Radio*, is that there is "no case" for the subscribers who are discontented, and that they must pay their dues punctually. It amounted to an expression of opinion by the Court that Ravag has all along been doing its best, and that faulty transmission is due to local conditions.

France.—RAILWAY WIRELESS.—The inauguration of the first railway wireless service on French trains took place on February 8th, when the State Railway invited 250 guests to make a journey by train, which consisted of seven coaches; an aerial was stretched along the roof of the second coach and a similar aerial along the roof of the third coach, beneath which was a second wire extending along one-third of its length, used as a counterpoise. The object of the aerials is to send and receive telegrams on short waves during the journey. One compartment in each of these coaches was fitted with the receiving and transmitting sets, a gramophone pick-up, and a large frame mounted inside a second large frame, which can be tuned independently. A seven-valve superheterodyne set is used for broadcast reception. Each compartment is fitted with plugs for earphones, which are procured from the radio agent on the train. The operators wear a neat blue uniform and armlets bearing the words "Radio-Fer T.S.F." The service came into public use on February 10th between Paris and Le Havre. In addition, telegrams can be sent and received while travelling.

Germany.—LICENCES.—The number of wireless reception licence-holders reached 3,066,682 at the end of 1929, having increased by nearly a quarter of a million in the last quarter of the year.

India.—GOVERNMENT SCHEME.—At a general meeting on February 17th of the Indian Broadcasting Company, a resolution for its voluntary winding up was adopted.

According to *The Times*, the directors' recommendation has been followed by the decision of the Government of India to take over the concern from the liquidators. The transfer will become effective from March 1st, and from the outset broadcasting will continue exactly as before. The purchase price is said to be about three lakhs of rupees (£22,500), and the department concerned has submitted its proposals to the Standing Finance Committee of the Legislative Assembly. The Government policy in this connection has been under discussion for two years, owing to the constant signs of the Broadcasting Corporation's financial difficulties. It was at first held that the matter concerned the provinces, and the opinions of the provincial governments on whether the State should take over broadcasting at their expense were secured. All except the Punjab decided that broadcasting was of no educational value and therefore unworthy of expenditure. Now the Central Government has resolved to undertake the work.

It is proposed to establish a board of control, which will probably comprise eight members, four official members, including the Government member concerned, who will be chairman, two non-official members from Bombay, and two non-official members from Calcutta. There will also be a secretary and a financial adviser.

The Standing Finance Committee of the Legislative Assembly fixed a maximum limit for the purchase price and approved the allocation of one-and-a-half lakhs of rupees (£15,000) for working expenses during the financial year beginning on April 1st.

According to *Reuter's* Agency, the Standing Committee of Assembly approved the Government's proposal to acquire the company for a period of two years. The annual recurring expenditure is estimated at two lakhs 67,000 rupees, with a net charge against revenue of one lakh 41,000 rupees. The Finance Committee agreed to the proposal, subject to the condition that the Government shall do its best to secure the advantage of the latest experience in countries where broadcasting has been a success and that steps be taken to so train Indians that the business will eventually pass into Indian hands. The Government proposes to appoint in the summer of 1931 a representative committee, to examine the position with regard to the taking over of broadcasting and prospects generally, as experience would by then have been gained of the success of the service under Government management.

Luxemburg.—PRIVATE TRANSMITTERS.—A new law has just been made in the Grand Duchy which permits the erection of privately-owned transmitters as well as State-owned ones. According to *World-Radio*, however, a special concession from the Postal-Telegraph Authorities is necessary. No control is exercised over them, but certain conditions are imposed for the granting of such a concession. The new law makes no regulations as to the ownership or use of receiving sets.

Mains-driven Sets.—BURNLEY CHANGE-OVER.—Owners of radio receiving sets, who will be affected by the Burney Corporation Electricity Department's change-over from d.c. to a.c. distribution, resent the Corporation's policy of disclaiming responsibility. The mayor is reported to have stated that the Corporation was not consulted when the sets were installed, and it is therefore very unreasonable to attempt to make it responsible. The electrical engineer is said to maintain that there is no precedent for the compulsory replacement of radio apparatus by electricity supply authorities. There are some 8,000 licence holders in the district, and he estimates that 4,000 would be equipped with battery eliminators. The cost to the Electricity Department, if the Corporation were to compensate every wireless set user, would be between £12,000 and £15,000, which would be equivalent to a 6d. rate.

Switzerland.—REORGANISATION PLANS.—The plan of reorganisation published in September last has since been slightly revised, says *World-Radio*, the Swiss authorities having ordered stations of higher power than previously intended. The main transmitter for French-speaking Switzerland at Sottens, near Moudon, will have an aerial power of 25 kW. The station for German-speaking Switzerland at Beromünster, in the Canton of Lucerne, will have 60-kW aerial power. Those stations will be erected in 1930. The programme for 1930 further comprises the erection of a 1-kW relay station for Geneva, and 0.5-kW relay stations for Basel and Berne, respectively, and 3-kW relay plant in the Tessin.

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the ELECTRICAL REVIEW containing the advertisement is given in parentheses below.

Contracts Open.

Australia.—MELBOURNE.—March 3rd. State Electricity Commission of Victoria. Supply of 44,000-V tensioning and pin-type supporting insulators. (B.X. 6177.)*
April 14th. 22,000 V switchgear and accessories for sub-station "C" at Brunswick. (B.X. 6182.)*
May 12th. Supply of 22,000-V pin-type supporting insulators, for 12 months. (B.X. 6179.)
Posts and Telegraph Department. April 1st. Submarine cable. (B.X. 6070.)*
April 15th. Cord type switchboards. (B.X. 6135.)*
April 29th. Telephone relays. (B.X. 6157.)* P.A.B.X. relay sets. (B.X. 6158.)*

Ayrshire.—March 5th. Education Authority. Electrical work at the additions and alterations of the Fenwick Public School. Electric lighting installation at the new school and school-house, Cronberry. Schedules from Wm. Reid, Master of Works, Education Offices, Ayr.

Bedford.—March 10th. Electricity Department. Supplies during the year ending March 31st, 1931, of e.h.p., l.p., and l.p. underground cables, and incandescent electric lamps. (February 14th.)

Belfast.—March 3rd. Electricity Department. Supply of stores, for 12 months, commencing April 1st, 1930. (February 14th.)

Belgium.—ANDERLECHT, BRUSSELS.—March 5th. Municipal authorities. Supply of l.p. and h.p. electric cable. Tenders to Hotel Communal, and particulars (Cahier des charges) for 4 francs, from Régie de l'Electricité, 4, Rue Van Lint, Anderlecht.

Blackburn.—March 10th. Electricity Committee. Supply of paper-insulated lead-sheathed cables, rubber-insulated wire, meters, and gasfilled and vacuum lamps for twelve months ending March 31st, 1921. February 14th.)

Cardiff.—March 20th. Electricity Department. Supply and delivery of e.h.p. and l.p. paper-insulated cables during twelve months commencing April 1st, 1930. (See this issue.)

Dover.—March 3rd. Harbour Board. Electrical sundries and electrical cables for a year. R. Mowll, Registrar, Castle Street (Schedules 2s. 6d. each).

Edinburgh.—March 24th. Corporation. Supply for twelve months from May 16th, 1930, of underground insulated cables, underground conduits, pavement and road box frames and covers, house service fuse boxes and fuseboards, meters, link disconnecting boxes and cable dividing boxes. (February 14th.)

Erith.—March 7th. Electricity Department. H.p. and l.p. underground cable, joint boxes and other accessories. (See this issue.)

Glasgow.—March 5th. Town Council. Electric lighting installation for houses at fire station. Schedules from Electricity Manager, 75, Waterloo Street.

Grangemouth.—Town Council. Electrical work at water filtration works. Schedules (£2 2s. deposit) from Burgh Engineer.

Harrogate.—March 15th. Electricity Department. Supply of general stores for 12 months commencing May 1st, 1930. (February 21st.)

India.—NEW DELHI.—March 5th. India Stores Department. Battery-charging motor-generator for the Indian Telegraphs Department. (B.X. 6146.)*

Kettering.—March 7th. Electricity Department. Supply and delivery of transformers. (February 21st.)

Leek.—March 10th. Cheddleton Mental Hospital. Electric lamps for six months. F. G. Eve, clerk and steward.

London.—CENTRAL ELECTRICITY BOARD.—March 3rd. Construction of site works, foundation works, and buildings in the area of the South East-England Electricity Scheme. (February 7th.)

March 24th. Supply, delivery and erection of 33 kV and lower voltage transformers, for the North-West England and North Wales Electricity Scheme. (See this issue.)
March 31st. Supply, delivery and erection of metering equipment required in the area of the North-West England and North Wales Electricity Scheme. (See this issue.)
L.C.C.—March 24th. Supply and erection in Blackwall tunnel of four electrically-driven exhaust propeller fans and two centrifugal blowing-fan sets. Four steel lattice girders, various steel joists, platforms, &c. (See this issue.)
BETHNAL GREEN.—Borough Council. March 17th. Supply, delivery and laying of l.p. cables, pipes, &c. (See this issue.)

Leicester.—March 7th. Corporation. Installation and fixing of wiring and fittings for electric lighting, &c., at the Belgrave pumping station. (February 14th.)

Liverpool.—March 12th. Electricity Supply Department. Supply of 5,000-kVA, 12,500-kVA, and 33,000-V step-down transformers and 6,000-V and 33,000-V metal-clad switchgear for sub-stations. (February 21st.)

Manchester.—March 1st. Board of Guardians. Electric cables required for the Styal Cottage Homes, Handforth. March 4th. Electrical equipment. Particulars from E. Hargreaves, superintendent of works, Union Offices, All Saints, Manchester.

New Zealand.—WELLINGTON.—April 29th. Public Works Department. One 10,000-kVA synchronous condenser and accessories. (B.X. 6034.)* Single-phase transformers and accessories. (B.X. 6035.)*
May 6th. 750-kVA transformers for Arapuni power scheme. (B.X. 6095.)*
May 13th. 110-kV transformers for Mangahao power scheme. (B.X. 6096.)*

Oldham.—March 10th. Board of Guardians. Electric lamps and fittings. F. W. Fletcher, clerk.

Prestwich.—March 10th. Urban District Council. Electric lamps required during the year 1930-31. Form of tender, &c., from H. T. Ainsworth, Surveyor to U.D.C., Town Hall.

Rhondda.—March 29th. Electricity Department. Supply of a.c. house service meters, cables, joint boxes, compound, cut-outs, &c. (February 21st.)

South Africa.—CAPE TOWN.—April 2nd. Electricity Department. Five sets of electrically-driven pumps, with accessories, &c. (A.X. 9096.)*

Southend-on-Sea.—March 3rd. Corporation. Supply of general stores for 12 months, commencing April 1st, 1930. (February 7th.)

Stirling.—March 3rd. Corporation. Electrical installations for 52 houses. Specifications (deposit £1) from A. H. Goudie, Burgh Engineer.

Stoke-on-Trent.—March 12th. Electrical Engineer's Department. Supply for 12 months of e.h.p. truck type switchgear and a.c. and d.c. meters. (February 21st.)

Torquay.—March 10th. Electricity Department. Supply, delivery, and erection of one 7,500-kW turbo-alternator and condensing plant. (February 21st.)

Walsall and West Bromwich.—March 6th. Unions Joint Committee. Electrical fittings. Form of tender from A. H. Ward, Clerk to the Committee, 12, Lombard Street, West Bromwich.

Walthamstow.—March 7th. Electricity Department. Supply and delivery of l.p. distributor and service cables as required during the year ending March 31st 1931. (See this issue.)

Warrington.—March 10th. Electricity Department. Motors and transformers. (February 21st.)

Westhoughton.—March 3rd. Urban District Council. Electric metallic filament lamps required during the year ended March 31st, 1931. Form of tender from G. Hayes, surveyor to Urban District Council, Town Hall.

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.

Contracts Closed.

Brighton.—Lighting Committee. Recommended :—
E.h.p. switchgear (£743).—A. Reyrolle & Co., Ltd.
L.p. switchgear (£543).—George Ellison, Ltd.
Markets Committee. Accepted :—
Renewing electrical installation at Open Market (£420).—W. A. Gooding & Sons.

Croydon.—Electricity Committee. Recommended :—
Nine transformers (£3,168).—British Electric Transformer Co., Ltd. Switchgear (£7,880).—A. Reyrolle & Co., Ltd.

Dumfries.—Town Council. Accepted :—
Installing electric light in 32 houses.—John Marshall.

Glasgow.—Police Committee. Recommended :—
550 electric lamps, without accumulators (£144).—Ericsson, Ltd.

Government Contracts.—The undermentioned contracts were placed by the various Government Departments during January, 1930 :—

ADMIRALTY (CONTRACT AND PURCHASE DEPARTMENT).

Accumulators.—Edison Swan Electric Co., Ltd.; Tudor Accumulator Co., Ltd.; Chloride Electrical Storage Co., Ltd.; D.P. Battery Co., Ltd.; Fuller Accumulator Co. (1926), Ltd.
Alternators and generators.—Mackie & Co., Ltd.
Electric bells.—Hawkers, Ltd.; Engineering and Lighting Equipment Co., Ltd.; Bonnella Bros.
Switch and fuse boxes and spares.—W. McGeoch & Co., Ltd.
H.p. and radiographic couch.—A. E. Dean & Co.
Electric jib cranes.—Sir Wm. Arrol & Co., Ltd.; Cowans, Sheldon & Co., Ltd.
Electric travelling crane.—Marshall, Fleming & Co., Ltd.
Heating elements.—Credenda Conduits Co., Ltd.
Ceiling fans.—Kingston Engineering Co., Ltd.; Revo Electric Co., Ltd.
Electric lamps.—General Electric Co., Ltd.; Edison Swan Electric Co., Ltd.
Electric lifts.—Smith, Major & Stevens, Ltd.
Portable electric drilling machines.—Consolidated Pneumatic Tool Co., Ltd.
Mica.—Mica & Micanite Supplies, Ltd.; Mica Mfg. Co., Ltd.; Micanite and Insulators Co., Ltd.
Micanite.—H. Clark & Co. (Manchester), Ltd.; Mica Mfg. Co., Ltd.; A. Pearce & Co.
Pumps.—Rees Roturbo Mfg. Co., Ltd.; Worthington, Simpson, Ltd.

AIR MINISTRY.

Diesel generating set, Aboukir.—Belliss & Morcom, Ltd.
Buzzers.—Johnson & Phillips, Ltd.
Generators.—M-L. Magneto Syndicate, Ltd.
Petrol-electric generating sets.—Douglas Motors, Ltd.
Motor-alternator sets.—Crompton Parkinson, Ltd.

POST OFFICE.

Telephone apparatus.—Automatic Telephone Mfg. Co., Ltd.; Ericsson Telephones, Ltd.; General Electric Co., Ltd.; A. W. Hart & Co.; Plessy Co., Ltd.; Siemens Bros. & Co., Ltd.
Battery stores.—Alton Battery Co., Ltd.; Ericsson Telephones, Ltd.; Ever-Ready Co. (Gt. Britain), Ltd.; Fuller Accumulator Co. (1926), Ltd.; General Electric Co., Ltd.
Terminal blocks.—T. De La Rue & Co., Ltd.; Ebonestos Insulators, Ltd.
Cable (various).—British Insulated Cables, Ltd.; Callender's Cable & Construction Co., Ltd.; Connolly's (Blackley), Ltd.; Enfield Cable Works, Ltd.; General Electric Co., Ltd.; W. T. Glover & Co., Ltd.; Hackbridge Cable Co., Ltd.; W T. Henley's Telegraph Works Co., Ltd.; Johnson & Phillips, Ltd.; Pirelli-General Cable Works, Ltd.; Siemens Bros. & Co., Ltd.; Standard Telephones & Cables, Ltd.; Union Cable Co., Ltd.
Loading coils.—Standard Telephones & Cables, Ltd.
Ducts.—Albion Clay Co., Ltd.; Donington Sanitary Pipe and Fire Brick Co., Ltd.; Doulton & Co., Ltd.; Hepworth Iron Co., Ltd.; G. Jennings; J. Oakes and Co. (Riddington Collieries), Ltd.; Oates and Green, Ltd.; J. Place & Sons, Ltd.; Sutton and Co. (Overseal), Ltd.
Troughing.—Calders, Ltd.
Lead tube.—T. & W. Farmiloe, Ltd.
H.d. copper wire.—E. & E. Kaye, Ltd.; Whitecross Co., Ltd.
Switchboard wire.—General Electric Co., Ltd.
Electric lighting installation (Birmingham automatic telephone exchange).—Reynolds & Bradwell.
Electric lift (Wigan telephone exchange).—W. Wadsworth and Sons, Ltd.
Additional loading (London-Derby cable).—Standard Telephones and Cables, Ltd.
Motor-generator (Central (London) telephone exchange).—Haslam & Newton, Ltd.
Power plant (Valentia radio station).—Davey, Paxman and Co., Ltd.
Telephone exchange equipment.—L. Berger & Sons, Ltd. (London, E.9): Bradbury, Agnew & Co., Ltd. (London, E.C.4 and E.C.1): Relay Automatic Telephone Co., Ltd. Silverthorn (Chingford); Bristol Central; Bristol North; Easton; Kingswood; Westbury; Bedminster; Bristol South; Bristol West; Whitchurch; and Stoke Bishop: Automatic Telephone Mfg. Co., Ltd. Sub-contractors for Bristol Central, North, Easton, Kingswood, Westbury, Bedminster, South and West: Electric Construction Co., Ltd., for charging and ringing machines; Alton Battery Co., Ltd., for batteries. Perth: General Electric Co., Ltd. Maida Vale: Siemens Bros. & Co., Ltd. Acorn (Acton): Standard Telephones and Cables, Ltd. Sub-contractors: Electric Construction Co., Ltd., for charging machines; Crompton Parkinson, Ltd., for ringing machines; Chloride Electrical Storage Co., Ltd., for batteries.
Telephone repeater equipment (Bristol).—General Electric Co., Ltd.

CROWN AGENTS FOR THE COLONIES.

Cable and joint boxes.—W. T. Glover & Co., Ltd.
Copper.—F Smith & Co.; R. Johnson & Nephew, Ltd.
Electric cookers.—Revo Electric Co., Ltd.
Electrical equipment.—J. Stone & Co., Ltd.
Electricity meters.—Chamberlain & Hookham, Ltd.
Electric hoist.—Smith, Major & Stevens, Ltd.
Electric motors.—Metropolitan-Vickers Electrical Co., Ltd.
Electric water heaters.—Manlove, Alliott & Co.
Fans.—Crompton Parkinson, Ltd.
Overhead line materials.—Bullers, Ltd.
Pumps.—Rees Roturbo Mfg. Co., Ltd.
Signal mechanism.—British Power Railway Signal Co., Ltd.
Static transformers.—Brush Electrical Engineering Co., Ltd.
Street-lighting materials.—General Electric Co., Ltd.
Telephone cable.—British Insulated Cables, Ltd.; Siemens Bros. & Co., Ltd.; Standard Telephones and Cables, Ltd.
Train-lighting cells.—Chloride Electrical Storage Co., Ltd.
Wire.—Shropshire Iron Co., Ltd.

Glasgow.—Watch Committee. Accepted :—
2-ton petrol-electric tower wagon (£1,125).—Ransomes and Rapier, Ltd.
Municipal Transport Committee. Recommended :—
Tram rails (£25 250).—Dorman, Long & Co., Ltd.
Switchgear for Pinkston power station (£32,081).—General Electric Co., Ltd.
Copper bonds.—Thomas Bolton & Sons, Ltd.
Insulated bolts.—British Insulated Cables, Ltd.
Commutators for G.E. 58 motors.—P. R. Jackson & Co., Ltd.

Grimsby.—Electricity Committee. Recommended :—
10,000-kW turbo-alternator and condensing plant (£31,405).—Metropolitan Vickers Electrical Co., Ltd.

Kettering.—Electricity Department. Accepted :—
E.h.p. cable (£6,020).—Union Cable Co., Ltd.
L.p. cable (£8,506).—Croydon Cable Co., Ltd.

Leicester.—Sewage Committee. Accepted :—
200 kVA transformer for Belgrave pumping station (£130).—Brush Electrical Engineering Co., Ltd.
Switchgear for pumping station (£413).—New Switchgear Construction Co., Ltd.

London.—ADMIRALTY :—
Electric lamps.—Metro-Vick Supplies; Edison Swan Electric Co., Ltd.

LONDON MIDLAND & SCOTTISH RAILWAY CO. :—
Part contract for electric lamps for 12 months.—Metro-Vick Supplies.

CENTRAL ELECTRICITY BOARD.—Contracts placed in connection with the Mid-East England Electricity Scheme (approximate total value £230,000) :—
33-kV transmission lines.—Johnson & Phillips, Ltd.
132-kV transformers.—English Electric Co., Ltd.
The contract for transformers is additional to those recently announced.

ST. PANCRAS.—Contract and Stores Committee.
660 yd. of 4-way, 4-in. stoneware conduits (£319).—Albion Clay Co., Ltd.
Electricity and Public Lighting Committee.
Installing grit arresting apparatus for Nos. 7 and 8 pulverised fuel boilers at the King's Road generating station (£5,100).—Babcock & Wilcox, Ltd.

HAMMERSMITH.—Electricity Committee. Accepted :—
2,500 yd., .2 sq. in., 11,000-V cable (£4,723).—Enfield Cable Works.
1,250 yd. 4 in., two-way conduit (£302).—Doulton & Co., Ltd.

STEPNEY.—Electricity Supply Committee.
Solder (£215).—H. B. Barnard & Sons.
Steel piling for turbo-generator foundations, &c. (£1,050).—D. G. Somerville & Co., Ltd.

Liverpool.—City Council. Accepted:—
50,000-kW maximum continuous rating turbo-alternator with accessories (£187,870).—Metropolitan-Vickers Electrical Co., Ltd.

South Shields.—Electricity Committee. Accepted:—
Two transformer regulating switches (£270).—British Electric Transformer Co., Ltd.

Forthcoming Events.

Birmingham Electric Club.—Friday, February 28th. Grand Hotel, Birmingham. 7 p.m. "Electric Propulsion of Ships." Mr. W. J. Belsey.

Physical Society.—Friday, February 28th. Imperial College of Science, South Kensington, S.W. 5 p.m. Ordinary meeting.

Junior Institution of Engineers.—Friday, February 28th. 39, Victoria Street, Westminster, S.W. 7.30 p.m. "Notes on the Design of Dynamos for Automobiles." Mr. J. Rowcroft. March 7th. 7.30 p.m. "Chile, and Engineering in Chile." Lt.-Col. G. J. Hartley, R.E.

Electrical Trades' Commercial Travellers' Association.—Friday, February 28th. Connaught Rooms, W. 7 p.m. Fifth annual dinner.

Edinburgh Electrical Society.—Saturday, March 1st. Visit to Carron Company's Works, Falkirk.

Institution of Electrical Engineers.—INFORMAL MEETING.—Monday, March 3rd. Institution, Savoy Place, W.C.2. 7 p.m. Discussion on "Push-button Control," to be opened by Mr. J. J. Fisher.

(Wireless Section).—Wednesday, March 5th. Institution, Savoy Place, W.C 2. 6 p.m. "Some Developments of the Piezo-Electric Crystal as a Frequency Standard." Mr. H. J. Lucas; and "The Valve-maintained Quartz Oscillator," Mr. J. E. P. Vigoureux.

(Meter and Instrument Section).—Friday, March 7th. Institution, London, W.C.2. 7 p.m. "An Investigation of the Frequency Variations in Induction Watt-hour Meters." Messrs. A. E. Moore and W. T. Slater.

(North-Western Centre).—Tuesday, March 4th. Engineers' Club, Manchester. 7 p.m. Discussion on "Low-temperature Carbonisation of Fuel with Special Reference to its Combination with the Production of Electricity," to be opened by Messrs. E. H. Smythe and E. G. Weeks.

(South-Midland Centre).—Monday, March 3rd. University, Birmingham. 7 p.m. "The Heating of Buildings Electrically by means of Thermal Storage." Lt.-Col. S. E. Monkhouse and Mr. L. C. Grant, and, "The Heat Pump—an economical Method of Producing Low-grade Heat from Electricity." Mr. T. G. N. Haldane.

(East-Midland Sub-Centre).—Tuesday, March 4th. "Television—Progress and Applications." Mr. J. J. Denton.

(Tees-Side Sub-Centre).—Wednesday, March 5th. Cleveland Technical Institute, Middlesbrough. 7.15 p.m. Address by Mr. B. A. Robinson, chairman of the North-Eastern Centre.

(North-Eastern Students' Section).—Friday, March 7th. Armstrong College, Newcastle-on-Tyne. 7.15 p.m. "Insulation Testing." Mr. W. A. Cook.

(North Midland Students' Section).—Saturday, March 1st. 2.15 p.m. Visit to John Fowler & Co.'s works, Hunslet, Leeds.

Institution of the Rubber Industry (London and District Section).—Monday, March 3rd. Engineers' Club, Coventry Street, W. 7.30 p.m. "An Instrument for Testing Hardness and other Properties of Rubber," and "A Method of Making Electrical Contact with Ebonite and Soft Rubber for Insulation Tests." Dr. H. A. Daynes.

Electrical Society of Glasgow.—Tuesday, March 4th. Reid's Smoke Room, 30, Gordon Street, Glasgow. 7.30 p.m. Annual general meeting.

Institution of Ventilating and Heating Engineers.—Wednesnesday, March 5th. Swedenborg Hall, 29, Hart Street, Bloomsbury, W.C.1. 7 p.m. Discussion on "The Space Required for Central Station Equipment."

British Engineering Standards Association.—Thursday, March 6th. Grocers' Hall, Princes Street, E.C.2. 6.45 p.m. Banquet to celebrate the granting of the Royal Charter to the Association.

Batti-Wallah's Society.—Thursday, March 6th. Hotel Cecil. 12.30 for 1 p.m. Luncheon. Address by Sir Felix Pole.

North-East Coast Institution of Engineers and Shipbuilders.—Friday, March 7th. Bolbec Hall, Newcastle-on-Tyne. Informal meeting on "The Effect of the Use of Electricity in Workshops on Efficiency and Costs."

Royal Institution of Great Britain.—Saturday, March 8th. 21, Albemarle Street, W.1. 3 p.m. "Atomic Nuclei and their Structure." Sir E. Rutherford, Pres. R.S.

Electrical Power Engineers' Association (London Local Technical Group).—Saturday, March 8th. Café Royal, Regent Street, W. 6.45 for 7 p.m. Annual dinner and dance.

(Birmingham Local Group).—Thursday, March 6th. Engineering and Scientific Club, Wolverhampton. 7.30 p.m. "Cable Testing." Mr. D. J. E. Shirt.

Royal Society of Arts.—Tuesday, March 14th. John Street, Adelphi, W.C. 4.30 p.m. "British Trade with India." Mr. T. M. Ainscough.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We shall be glad to learn the names and addresses of makers of the following devices:—

A C D hair dryer.

Fuse bridge stamped with the figures 1524.

Notes.

The Word "Capacitor."

We have the following letter as we go to press:—In an article in the *Electrical Times* of February 20th, it is stated that the word "Capacitor" was coined not long ago and that it was born in America. May I call attention to the fact that I suggested the word "Capacitor" in an article in the ELECTRICAL REVIEW, on April 11th, 1924. I do not know if this was the first time the term was suggested, but, at any rate, I had not seen it in use before. Not long afterwards it began to appear in American papers. The origin of the word is interesting as I deduced it by "Method in Invention," upon which subject I wrote a paper some twenty years ago, and on which more recently I gave an informal paper to the I.E.E.

The great value of the "Methods" is that they can be used for producing all sorts of inventions. Not only are they of use for inventing new machinery and new terms such as "Capacitor," but they can be used with great success in the teaching of mathematics and in the evolution of new mathematical ideas. The one thing they cannot do is to get English people interested in the results. Some time ago, while working on the "Methods," I discovered that it would be possible to run a film through a kinema at a steady speed instead of by a series of jerks, the compensation for the movement of the film being produced optically. The idea was obviously correct, but it was almost impossible to get an English maker to look at it. Subsequently, I see that this idea has been introduced by a German firm, and doubtless our English kinema men will be taking out licenses at enormous cost.

Coming back to the word "Capacitor," I have not written for self-aggrandisement, but because I think it should be known that all new ideas do not come from across the Atlantic. At the same time it would be encouraging if English people were just a little more willing to receive a new idea when it does turn up.—C. TURNBULL, North Shields, February 24th, 1930.

Association of Supervising Electrical Engineers.

The annual dinner of the Association was held on February 22nd at the Hotel Cecil, when close on 300 members and guests assembled under the chairmanship of the president, Mr. S. B. DONKIN, M.Inst.C.E., M.I.E.E., M.I.Mech.E. The loyal toast having been honoured, the president proposed the toast of "The Electrical Industry." He commended to the active notice of members the promotion of two-part tariffs and off-peak loads, the simplification of wiring of houses (so that one wiring system and one meter only would be required per installation), and the improvement of the apprenticeship system. He referred to the lower prices of goods brought about by the B.E.S.A. and E.R.A., and also by the new regulations of the Electricity Commissioners for overhead lines. The experimental scheme for electrical development in Bedfordshire already gave indications of a large demand in rural areas. While the operations of the Central Electricity Board might reduce the number of individual orders for plant at the outset, in ten years' time the effect would be to create a much larger demand for plant of all kinds. In regard to the inva-

sion of American capital, he asked what was the motive behind it. British manufacturers would resent its being used to take away orders from them.

Mr. V. WATLINGTON, M.B.E. (chairman, B.E.A.M.A.), responding, pointed out the importance of the electrical export trade, which was indicated by the fact that its value amounted to £20,000,000 out of the £80,000,000 produced annually. Apart from all political questions, we could all agree to buy British goods. The members of the Association, understanding local conditions, could help the manufacturers by letting them know clearly what they wanted. The electrical industry was the one bright spot in British trade, but it was employed to only 60 per cent. of its full capacity.

Mr. P. ROSLING (chairman, C.M.A.), seconding the response, stated the case for fair remuneration for all parties, which could not be obtained by unregulated competition—a condition which militated against good work.

Mr. J. S. HIGHFIELD (past president, A.S.E.E.) proposed the health of the guests, among whom were numbered many illustrious names.

Col. Sir THOMAS F. PURVES, O.B.E. (president I.E.E.), replied on behalf of the guests. He said that if the A.S.E.E. were to consider the I.E.E. in a parental relation, the I.E.E. would not object. He recollected the agitation against the bicycle before the coming of the motor car, which was similar to the feeling against Post Office poles before the advent of "pylons," a sonorous word for an opponent's use.

Sir ARCHIBALD PAGE, also responding, said that much dead wood must be cut from the electricity supply tree before vigorous growth would be possible. The reorganisation of electricity supply was not the end of the work; a rapid extension of distribution was also requisite. The Electricity Commissioners deserved great credit for producing seven out of a total of nine schemes within three years. The C.E.B. had placed contracts for well over £60,000,000 with British manufacturers, who had been able to provide everything for which they had been asked. All the authorised undertakers were co-operating magnificently with the Board. The Scottish grid would be officially opened in April, though large sections were now in use.

Mr. B. C. GARMAN (chairman, A.S.E.E.) announced that a silver emblem, reproducing the Association's badge and motto of "ease, the path to progress," had been struck. No. 1 emblem, however, was in gold, and this he presented to Mr. S. B. Donkin to commemorate his two years' presidency. The president, to whom this part of the proceeding came as a surprise, briefly returned thanks.

The evening terminated with a well-arranged variety programme.

Electrical Power Users' Association.

The annual dinner and dance of the Scottish division of the Electrical Power Users' Association was held in Glasgow on February 15th. Mr. G. Gunn presided over an attendance of about a hundred. Proposing the toast of the "Electricity Supply Industry," Professor S. Parker Smith said he did not think electrical engineers were doing all they could to further the interests of their own industry. There was an optimistic outlook for the industry if they would only set the example and demonstrate the many and varied uses of electricity. Mr. D. M'Dougall, Greenock, responded. Advocating the greater use of electricity, Councillor P. J. Dollan said only approximately 45 per cent. of the houses in Glasgow were wired. They had to visualise wiping out the gas industry so far as its household use was concerned. Gas was out-of-date as a domestic agency, and they should be courageous and tell the whole community that the sooner Glasgow made up its mind to abandon gas as a household agency and to supplant it with electricity the better it would be for the community in every respect. Councillor Dollan suggested that instead of the Corporation Electricity Committee spending £5,000 a year on propaganda, it ought to double the expenditure and get round all the working-class householders, telling them of the benefits of electricity. Mr. Dollan, who had just returned from the Continent, said after his experience in Berlin and Leipzig he came back with the firm conviction that our shopkeepers, hotel owners, and restaurant proprietors had a great deal to learn from the Germans in the proper use of electricity. Berlin's main streets, because of the artistic and efficient use of electricity, were a delight to behold, whereas the main streets of Glasgow, because of the inefficient and inartistic use of electricity, made people want to get away from them as soon as possible after dark.

Grid Power Stations.

Some interesting opinions were expressed at a recent meeting of the Sheffield Society of Engineers and Metallurgists following the reading of a paper prepared by Mr. Douglas Hay (agent for Messrs. Newton Chambers & Co., Ltd.), and Mr. W. T. Townsend (consulting engineer to the same company), in which they contended that the whole area of Central England, as defined in the Weir report, could be supplied with electricity from waste-heat and residual-fuel power stations at a price substantially lower than that anticipated by the Central Electricity Board under the grid system.

In the discussion Sir William Ellis said electricity was not the most economical source of power unless it was generated under very favourable circumstances and by large sets. He believed that the use of electricity for power purposes in collieries was only in its infancy; one of the hindrances to the more general application of electricity at collieries was the continual danger of falls of roof affecting the cables.

Mr. F. Lloyd had little hope that the grid system would give Sheffield cheaper electricity. If the Electricity Commissioners were going to freeze out colliery owners, the best thing the latter could do would be to link up with the gas companies and provide cheap gas, which was a better proposition than dear electricity.

Prof. F. C. Lee expressed the opinion that, of necessity, a certain number of large power stations must be built in this country, and they should be unified in some way. At the same time he thought it desirable that they should encourage collieries, especially when they had coke-oven plant, and all large works wherein a considerable amount of heat had to be used, to work in co-operation with any particular grid system that might be established.

Mr. H. Etchells thought that where there was a possibility of the development of a large coal area the Government should come forward and put down an electricity station free of charge to supply the collieries that might be developed.

Prof. C. H. Desch felt that in the super-power scheme the advantages of economical generating from waste fuel had not been sufficiently considered.

Mr. J. M. Allan (chairman) remarked that a committee appointed by Sheffield employers to consider the question of supplying efficient and cheap electricity wanted to see large power stations outside the city, where coal and water were easily accessible.

Leicester Power Station Extensions.

The inauguration at Leicester on Wednesday last week of recent extensions to the city's electricity generating station, bringing the total expenditure upon the undertaking up to 2¼ million pounds, marked a further important stage of development in the general scheme of East Midlands supplies. A technical description of the extensions will appear in a later issue of the ELECTRICAL REVIEW. There was a large assembly at the ceremony, performed by Sir Andrew Duncan, chairman, Central Electricity Board, and afterwards guests were entertained at a celebration luncheon, held at the Grand Hotel, at which Sir Andrew spoke in terms of appreciation of the efficiency of the Leicester electricity undertaking. In the last two years the number of consumers in the Leicester area had risen from 7,000 to 36,999. Large numbers of private plants existed in industry, not because of any special need or because such arrangements were cheaper, but because it was not thought safe always to rely on the local supplies. That state of affairs should not, however, continue; Leicester had already convinced many such industrial concerns. Eventually all consumers would come to the public supply, and thus would be released capital for the expansion of legitimate industry now diverted from its proper and most profitable channels.

Mr. A. H. Swain, chairman of the Leicester Electricity Committee, said that unless they gave cheaper electricity quickly, so much the longer would the great industries be lagging behind, not only in home production, but in their ability to compete in the markets of the world. The progress which had been made at Leicester had been accomplished in all directions. The first turbo-alternator set up in 1922 was of 10,000 kW, and consumed 11¼ lb. of steam per unit generated; the new set, 25,000-kW, which was referred to and illustrated in our last issue, p. 337, consumed only 9¼ lb. of steam per unit. There had been a great saving also in the cost of installation, which would work out, when completed, at £10.3 per kW. The cost of some of the bigger stations was £21.2.

Mr. John Mould, engineer and manager, Leicester, spoke of the national as well as the local importance of the Leicester station. They burned about the lowest-grade coal in the world, the plant being specially designed to deal with such fuel. Although they might be beaten in some respects by undertakings which burned higher-grade coal, they in Leicester rendered a vast benefit to the Leicestershire collieries, while compared with stations which consumed anything like poor-quality coal, the Leicester station held a prominent position.

The I.M.E.A. Convention.

It is announced that arrangements have been made to hold the 35th annual convention of the Incorporated Municipal Electrical Association at Eastbourne from May 26th to 31st.

Appointments Vacant.

Electrical inspector for the Middlesex County Council Licensing Committee. Junior technical assistant in the Experimental section of the Admiralty Technical Pool at Portsmouth. Charge engineer for Whitehaven Corporation. Cookery demonstrator for Grimsby Corporation Electricity Department. Deputy electrical inspector and junior electrical inspectors of mines and quarries for the Secretary of Mines. Junior assistant engineer for Newport (Mon.) Corporation Electricity Department. (See our advertisement pages to-day.)

Educational.

Under the auspices of the Electrical Development Association there has just been carried through at Leeds an experimental series of lectures to domestic science teachers in the service of the Leeds Education Authority and students in training at the Leeds College of Housecraft. The course covered five lectures, and accommodation was found in the board room at the Corporation electricity works. With the approval of Dr. Graham, director of education, Leeds, and the co-operation of Mr. C. Nelson Hefford, M.Sc., M.I.E.E., city electrical engineer, a syllabus incorporating the following subjects, drawn up by the lecturer, Mr. C. F. Partridge, A.M.I.E.E., head of the Electrical Engineering Department. Leeds Technical College, was successfully carried through and proved in every way suitable for the purpose in view: Energy of various kinds—Electricity as a form of energy; Electrical circuits—Water analogy—Ohm's law—Power—B.O.T. unit; Chemical, heating, and magnetic effects of current; Conductors and insulators—Mechanical, chemical, and electrical properties; Controlling and protective devices, switches, fuses, &c. The average attendance was 125.

At the last lecture so keen was the interest aroused that an insistent demand for another lecture for the purpose of review and adequate discussion had to be conceded. At the sixth lecture Mr. Partridge had no fewer than nineteen questions to deal with, and the following examples give a good indication of the degree of absorption of instruction which had taken place : Why is the gasfilled lamp more efficient than the vacuum type?; why are switches made with the quick make and break?; and how can one tell the rating of an existing plug and socket?

Traffic Control by Lamp Signals.

Experiments are shortly to be made at Ludgate Circus, London, with a system of lamp signals for control of the road traffic. The system, which is similar to that used in connection with the Southern Railway Company's signalling apparatus, will be controlled from a kiosk to be built on the north refuge. Posts will be erected a few yards down each of the roads converging on Ludgate Circus and will bear red, amber, and green disks, representing "stop," "caution," and "go," respectively. On the results of this experiment is thought to rest the decision as to whether this form of traffic control shall be adopted permanently in London streets.

The Women's Engineering Society.

A second course in Simplified Engineering has now been inaugurated at Loughborough College, Leicestershire, for women who wish to train as factory inspectors, and for administrative and managerial posts in industry. This is a day course, lasting twelve weeks, and the students will not only attend lectures, but will be able to get practical workshop experience in the well-equipped workshops of the college. Application for this special training should be made direct to the Principal, Loughborough College, Loughborough. The Women's Engineering Society wishes to make it quite clear that this training does not in any way act as a substitute for training as an engineer. It has been devised for those women who wish to have some knowledge of modern engineering methods as a help in their own particular professions.

Our Personal Column.

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.

Mr. H. S. TOOGOOD has joined the Advertisement Staff of the ELECTRICAL REVIEW. For the past ten years he has held an important position with Industrial Publicity Service, Ltd., where he was specially connected with the advertising of many well-known firms in the electrical industry.

Mr. A. L. M. AYERS, A.M.I.Mech.E., has left the British Thomson-Houston Co., Ltd., to join the staff of the ELECTRICAL REVIEW. He joined the B.T.H. Co. in 1912 and for the last ten years has held the position of manager of its advertising department at Rugby.

Mr. E. JACOB, M.I.E.E., who was one of the founders, and for many years managing director of the Tudor Accumulator Co., Ltd., recently joined Britannia Batteries, Ltd., as managing director, jointly with Mr. E. G. LIND. Mr. G. C. ALLINGHAM, M.I.E.E., who was for a number of years an engineer with the Tudor Accumulator Co., Ltd., recently left the service of Metro-Vick Supplies to take up the position of sales manager of Britannia Batteries, Ltd.

Mr. J. J. MURPHY has resigned the position of chairman of the Irish Free State Electricity Supply Board, but he will continue to act as a part-time member of the Board. He is succeeded by Mr. R. F. BROWNE, a revenue official of the Free State Government.

Mr. JOHN W. DONOVAN, B.Sc., A.Am.I.E.E., has recently joined the firm of Donovan & Co., Birmingham. He has previously occupied positions with Messrs. George Ellison, the General Electric Co., U.S.A., and for the last three years has been control engineer with Cutler-Hammer Inc., Milwaukee, U.S.A.

Mr. C. H. STAFFORD, deputy manager and assistant engineer to the Reading Corporation tramway undertaking, has been appointed manager of the Burnley Corporation Tramways and Transport Department, out of 32 applicants. In 1912 he was appointed as power station superintendent.

Mr. JOHN CHRISTIE, electrical engineer and manager to the Brighton Corporation, has tendered his resignation after a service of thirty years. Mr. Christie is a native of Glasgow and commenced his business career as a marine engineer. He became associated with Crompton's works at Chelmsford, and later served with Siemens Bros. & Co. at Woolwich. He then became second engineer to the Glasgow Corporation Electricity Department. In 1894 he was appointed chief electrical engineer to the Londonderry Corporation. He remained in Ireland for four years and then returned to Glasgow as power house superintendent. During Mr. Christie's *régime* at Brighton the income of the electricity undertaking has risen from about £50,000 to £260,000.

The General Purposes Committee recently considered the changes which will occur when the Central Electricity Board takes over the Brighton generating station, and it has made a number of recommendations to the Council. One is that Mr. Christie should continue to act as consulting engineer to the Corporation at a salary of £1,000 until such time as a superannuation scheme is introduced, when for the purposes of the scheme Mr. Christie would be considered as still holding his present appointment. It is also recommended that if no scheme has been adopted when Mr. Christie reaches the age of 65 the salary should be reduced to £750 and continued until the adoption of a scheme.

Mr. D. M. BUIST, who has been appointed district engineer for North-East England, informs us that permanent offices for the district have now been obtained at 80, Jesmond Road, Newcastle-on-Tyne, and he expects to move into those premises on March 10th.

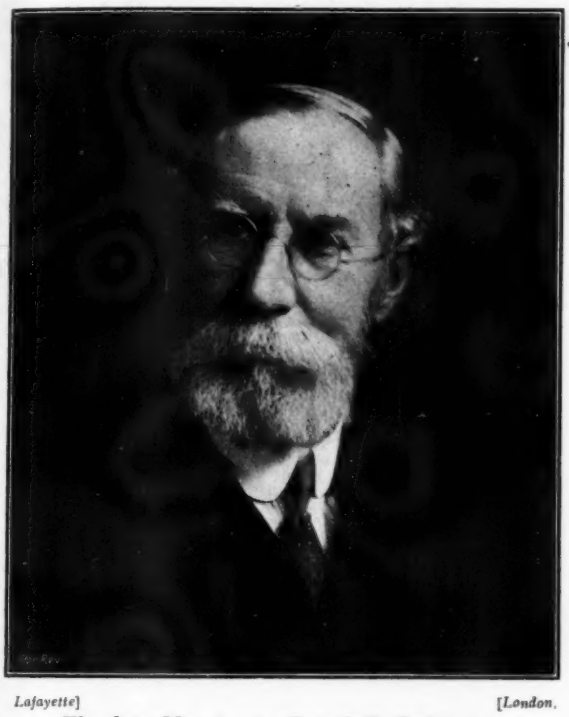
Mr. L. C. JESTY, B.Sc., who was married on February 19th to Miss M. G. Rawling, Fawley, has been presented with a canteen of cutlery by his colleagues on the staff of the Research Laboratories of the General Electric Co., Ltd., at Wembley.

Mr. PAUL H. MANGIN, late general manager of Millars Machinery Co., Ltd., has joined the board of Messrs. Lewenz and Wilkinson, Ltd.

Obituary.—Mr. A. A. CAMPBELL SWINTON.—As briefly mentioned in our last issue, Mr. Alan Archibald Campbell Swinton, F.R.S., M.Inst.C.E., M.I.E.E., M.I.Mech.E., passed away on the morning of Wednesday, February 19th, at his residence, 40, Chester Square, London, S.W., in his 67th year. Mr. Campbell Swinton was born in Scotland in October, 1863, the third son of Mr. Archibald Campbell Swinton, of Kimmerghame, Berwickshire, and Georgiana. After being educated at Edinburgh and abroad, he spent from five to six years at the Elswick works of Sir W. G. Armstrong, and was closely associated with the late Lord Armstrong in his electrical and other scientific researches.

His interest in electrical physics and the practical development of discoveries and inventions evolved by experimenters was spread over practically the whole of his career. Those interested in this aspect of his work will find in the ELECTRICAL REVIEW for January 24th, 1896, an article entitled "Photographing the Unseen; or the new Electro-photography," in which we announce Prof. Röntgen's epoch-making discovery and describe Mr. Campbell Swinton's own repetition of Röntgen's experiments, also reproducing photographs of the hand and a razor from a selection which he showed to us at the time. The range of his experimentation was very extensive, embracing the improvement of X-ray tubes and work in connection with television (more than 20 years ago), photography, telephony, wireless-telegraphy, and the steam turbine. He was a past-president of the Röntgen Society (1911-12), was an early experimenter in radio-telegraphy, becoming and remaining for many years president of the Radio Society of Great Britain, and ultimately a member of the Broadcasting Board. His interests indeed were so widespread that it is

difficult to enumerate them all; but mention must be made of his chairmanship of the British Scientific Instrument Research Association, his membership of the Executive Committee of the Board of the N.P.L., his connection with South Kensington College as a member of the Delegacy, his managership of the Royal Institution, and his vice-presidency of the Institution of Electrical Engineers (Associate 1886, member 1890), as well as his vice-presidency and chairmanship of Council of the Society of Arts. He carried out many works as consulting engineer, and was closely interested in the development of the turbine; he also wrote and read



Lafayette] *[London.*

The late Mr. A. A. Campbell Swinton.

many papers on electrical and scientific subjects for his various societies, and he frequently wrote for the scientific and technical Press. At so early a date as the year 1883, when only twenty years of age, he wrote a book entitled "The Principles and Practice of Electric Lighting," produced, as the preface intimated, for "the employers who use the light" and for the "general and scientific public, who take an interest in all new discoveries and inventions." A perusal of the book to-day is most entertaining from the historical standpoint, describing as it does the electrical machinery, accumulators, and other equipment, including incandescent and arc lamps, available nearly fifty years ago; but it is suggestive of the author's enthusiastic spirit of enterprise to find him in the year 1883 setting out the advantages and cost of electric lighting. We quote the closing paragraph of the book:—"Electricity as an illuminating agent is now upon its trial, and a few years will decide whether it is able to take the place of gas. In the opinion of many, the success of the new agent is already assured, and certainly it seems not improbable that, until supplanted by some fresh rival, electricity will furnish the light of the future."

Mr. Campbell Swinton was connected with many electrical companies in the course of his career and was a director of Crompton Parkinson, Ltd. (previously he was chairman of Crompton & Co., Ltd.); W. T. Henley's Telegraph Works, Co., Ltd.; the Cambridge Electric Supply Co., Ltd.; Bath Electric Tramways, Ltd.; Ceara Tramway, Light & Power Co., Ltd.; the Scarborough Electric Supply Co., Ltd.; the Kent Electric Power Co.; Edmundson's Electricity Corporation, Ltd.; Parsons' Foreign Patents Co., Ltd.; Parsons' Marine Steam Turbine Co., Ltd.; and other companies.

The professional and business life of Mr. Campbell Swinton was a very full one, and the reader will judge from the above mere mention of his interests in both branches of activity how large was his contribution to the foundation, development, and progress of applied electricity. Once more the profession and industry are made the poorer by the loss of an outstanding leader and worker.

On Saturday morning last a private service was held at Golders Green Crematorium and in the afternoon a memorial service was conducted by Archbishop Lord Davidson and Canon Mitchell at St. Michael's Church, Chester Square, London. Those present at the memorial service included Major and Mrs. Alan Swinton and other representatives of the family, also Lord Rayleigh, Sir C. A. Parsons, Sir George Sutton, Bart., Col. Sir T. F. Purves, Sir Dugald Clerk, Colonel R. E. Crompton, Messrs. A. H. Preece, A. M. Sillar, H. M. Jacob, G. L. Addenbrooke, A. H. Barker, J. Swinburne, P. Rosling and many others.

COL. A. SINCLAIR.—Another well-known electrical figure has passed from our midst with the death of Colonel Alexander Sinclair, M.I.E.E., V.D., J.P., of Swansea, which occurred on Tuesday, February 18th. Col. Sinclair was born in Aberdeen in 1861, and came to Hanover Square, London, for his early electrical education. He was with Messrs. Siemens Bros. at Charlton, and took a share in the manufacture and laying of the Mackay Bennett cable to America. He went to Swansea in 1885 as manager of the electro-chemical works of Messrs. Vivian & Sons. He remained with them for 40 years and retired five years ago. He became a member of the Institution of Electrical Engineers in 1887 and so continued to the last; he was also an associate member of the Institute of Civil Engineers. For more than thirty years he was very actively engaged in municipal work at Swansea. In the electrical affairs of the town, as is well known to our readers, he played a very important part, for he was chairman of the Electricity Committee from 1902 onwards. Few electricity committees in the country have been so favoured as Swansea in having a qualified electrical engineer to preside over their proceedings. He was Mayor in 1919-20 and twice Deputy-Mayor. He was a very active spirit in the proceedings of the Incorporated Municipal Electrical Association, of the Executive Council of which he was a member, and he will be much missed from its annual conventions. At the Bath meeting of the I.M.E.A. in 1928 the late Colonel contributed a paper jointly with Mr. J. W. Burr on electricity supply administration. He was deeply interested for many years in the Volunteer movement, and during the war was energetic in his recruiting efforts. Col. Sinclair leaves two sons, one of whom is Installation Inspector in the Swansea Electricity Department.

The funeral took place on Saturday at Oystermouth Cemetery, full military honours being accorded.

MR. J. C. HOWELL.—We also have to record with regret the death of Mr. J. C. Howell, consulting engineer of Llanelly, formerly well-known in electrical circles in Wales. Mr. Howell was originaly engaged as an engineer in his father's business of timber merchant. He is credited with installing the first electrical plant in Llanelly and other places in South Wales, where he was agent for Messrs. Crompton & Co. He was the inventor in 1884 of an accumulator in connection with which the Crompton-Howell Electric Storage Co. was formed, and batteries were supplied to several leading London electricity companies. Mr. Howell was 70 years of age.

Lafayette] *[Glasgow.*

Mr. Michael B. Field, O.B.E., M.Inst.C.E., M.I.E.E.,
managing director of Kelvin, Bottomley & Baird, Ltd., whose death was announced in our last issue.

MR. T. R. PENNINGTON.—The death is announced at the age of 49 years of Mr. Thomas Richard Pennington, of Tranmere, who for about 20 years was an electrical engineer with Messrs. Cammell, Laird & Co., Ltd.

MR. W. JUDD.—We regret to learn that Mr. Walter Judd, M.I.E.E., late of the Eastern Extension, Australasia and China Telegraph Co., Ltd., died on February 20th at the age of 77.

MR. J. G. BELLAAR-SPRUYT.—The death is reported from Amsterdam of Mr. J. G. Bellaar-Spruyt, the president of the Association of Dutch Central Station Engineers.

Financial Section.

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrica Companies, Dividend Changes, Transactions in Stocks and Shares.

New Companies Registered.

Franco Neon, Ltd.—Private company. Registered February 15th. Capital, £1,000 in £1 shares. Objects: To carry on the business of gas, electrical and general engineers, makers of and dealers in illuminated and other signs, illuminating, decorating and general contractors and merchants, &c. The subscribers (each with one share) are: E. F. Harrison, 25, Oxford Street, W.1, director of companies; A. H. Brachensey, 25, Oxford Street, W.1, director. Registered office: 25, Oxford Street, W.1.

Warrenpoint Electricity Supply Co., Ltd.—Private company. Registered in Belfast on February 12th. Capital, £3,000 in £1 shares. Objects: To acquire the benefits of the Warrenpoint Electricity Special Order, 1929, made by the Electricity Commissioners in favour of R. H. Hamilton, of Kilkeel. The directors are: R. H. Hamilton, Kilkeel, director; A. Robinson, Annalong, Co Down, quarry owner; J. Gordan, Annalong, Co. Down, quarry owner. Qualification: £100. Secretary: R. H. Hamilton. Registered office: The Electricity Works, Warrenpoint.

Arrow Electric Switches, Ltd.—Private company. Registered February 20th. Capital, £2,000 in £1 shares. Objects: To carry on the business of designers and manufacturers of and dealers in all kinds of electrical wiring devices such as switches, receptacles, plugs, sockets, lampholders, &c. The directors are: E. R. Grier (chairman) and W. W. Patteson, addresses not stated; and G. B. Seawright (managing director), 79, Great Queen Street Kingsway, W.C.2. Solicitors: Ranger, Burton & Frost, 179, Queen Victoria Street, E.C.4.

W. D. Foster & Co., Ltd.—Private company. Registered February 20th. Capital, £5,000 in £1 shares. Objects: To acquire the business of manufacturers and sellers of magnetos and batteries formerly carried on by W. D. Foster & Co., at 26, Hampstead Road, N.W.1. The subscribers (each with one share) are: G. F. Damer, 4, Talbot Road. Alexandra Park, N.22, law clerk; L. W. Ellis, "Jesserand," 32, Norbury Close, S.W.16, law clerk. Solicitors: Lawrence Messer & Co., 14, Old Jewry Chambers, E.C.2.

International Sales Organisation, Ltd.—Private company. Registered February 20th. Capital, £100 in £1 shares. Objects: To carry on the business of radio engineers, manufacturers of and dealers in gramophones and sound-reproducing machines, automatic machines, &c. The subscribers (each with one share) are: A. F. Galloway, Hampton Court Palace, Middlesex, and J. G. Fitzgerald, 11, Rothsay Gardens, Bedford, company directors. Registered office: 90, Regent Street, S.W.1.

Goodwin Radio, Ltd.—Private company. Registered February 17th. Capital, £500 in £1 shares. Objects: To carry on business as radio engineers, manufacturers of and dealers in electric accumulators and batteries, wireless aerials, cabinets, dials, transformers, gramophones and sound reproducing machines, radio gramophones, &c. The first directors are: E. A. Edwards, Oakdene, 47, Green Moor Link, Winchmore Hill, N.21, engineer; A. C. Baker, 87, Estcourt Road, Woodside, S.E.25, engineer (life directors). Qualification, £1. Registered office: 395, St. John Street, Clerkenwell, E.C.

J. B. Neale, Ltd.—Private company. Registered February 21st. Capital, £1,000 in £1 shares. Objects:—To acquire the business of a wholesale and general dealer in electrical appliances, &c., heretofore carried on by J. B. Neale, at 7, Charlotte Street, Fitzroy Square, W. The directors are: J. B. Neale, 7, Charlotte Street, W.1; Mrs. Eva D. Neale, Berneval, Sweetcroft Lane, Hillingdon, Middlesex. Secretary: J. B. Neale.

Official Returns of Electrical Companies.

Kartret Switchgear Co., Ltd.—Capital, £2,500 in £1 shares. Return dated January 3rd, 1930. All shares taken up. £2,500 considered as paid. Mortgages and charges, nil.

Precision Electric, Ltd.—Capital, £500 in £1 shares. Return dated January 13th, 1930. 100 shares taken up. £100 paid. Mortgages and charges, nil.

Telford Grier & Mackay, Ltd. (Incorporated in Scotland with place of business at 82, Fenchurch Street, E.C.).—Charge and assignation dated November 27th, 1929, to secure all moneys due or to become due from the company to Clydesdale Bank, Ltd., charged on all sums due and to become due to the company under a contract in respect of navigation lanterns supplied to H.M. Dockyard at Portsmouth. (Registered pursuant to Sections 79 and 90 of the Companies Act, 1929.)

Acme Electric Wire & Cable Co., Ltd.—S. I. Wallis, of King John's Chambers, Bridlesmith Gate, Nottingham, was appointed receiver on February 3rd, 1930, under powers contained in debenture dated August 18th, 1925.

Perak River Hydro-Electric Power Co., Ltd.—Capital, £1,000,000 in 500,000 8 per cent. preference and 500,000 ordinary shares of £1 each. Return dated January 14th, 1930. 500,000 preference shares and 431,237 ordinary shares taken up. £576,507 paid on 500,000 preference shares and 76,507 ordinary shares. £354,730 considered as paid on 354,730 ordinary shares. Mortgages and charges at date of return, £2,850,000. Since registered; charge dated January 29th, 1930, to secure £850,000.

Thomas J. Digby Illuminating Engineering Co., Ltd.—Capital, £20,000 in 10,000 preference and 10,000 ordinary shares of £1 each. Return dated January 24th, 1930. All shares taken up. £2 paid. £19,998 considered as paid. Mortgages and charges, nil.

G. S. Hawker, Ltd.—Capital, £1,000 in £1 shares. Return dated January 1st, 1930. 900 shares taken up. £400 paid. £500 considered as paid. Mortgages and charges, £550.

Yale Electric Power Co., Ltd.—Capital, £20,000 in 3,300 preference shares of £1 each and 668 ordinary shares of £25 each. Return dated December 5th, 1929. 525 preference and 668 ordinary shares taken up. £15,525 paid on 525 preference and 600 ordinary shares. £1,700 considered as paid on 68 ordinary shares. Mortgages and charges, £3,988 bank overdraft (secured by £6,000 debentures).

Western Electricity Supply Co., Ltd.—Capital, £250 000 in 100,000 6 per cent. cumulative preference and 150,000 ordinary shares of £1 each. Return dated November 25th, 1929. All shares taken up. £250,000 paid. Mortgages and charges, nil.

Ward Services, Ltd.—Satisfaction in full on August 19th, 1924, of debentures authorised April 28th, and registered May 21st, 1924, securing £1,200.

Æonic Radio, Ltd.—Deposit on February 6th, 1930, of deeds of freehold premises at Salfords, Horley, Surrey, and leasehold premises No. 15, Cromer Street, King's Cross, N., to secure all moneys due or to become due from the company to Lloyd's Bank, Ltd., not exceeding £16,000.

G. Yeldon, Ltd.—E. H. Hawkins, 4, Charterhouse Square, E.C.1, was appointed receiver on January 28th, 1930, under powers contained in a first mortgage debenture dated January 5th, 1929.

Instrument Wires & Cables, Ltd.—F. W. Paterson, 35, Great Tower Street, E.C.3, was appointed receiver on February 10th, 1930, under powers contained in debentures dated September 26th, 1928.

Central Power Engineering Co., Ltd.—T. J. McManis, 2a, Foster Lane, E.C., was appointed receiver and manager on February 3rd, 1930, under powers contained in debenture dated October 2nd, 1927.

"Phantestra" (Renn's Gramophone and Wireless), Ltd.—A. E. Middleton, 18, Essex Street, Strand, W.C.2, was appointed receiver on February 8th, 1930, under powers contained in first mortgage debentures created March 14th, 1919.

D. Hulett & Co., Ltd.—Capital, £5,000 in £1 shares. Return dated November 28th, 1929. 4,420 shares taken up. £320 paid, £4,100 considered as paid. Mortgages and charges, nil.

Brookhirst Switchgear, Ltd.—Capital, £550,000 in £1 shares. Return dated January 6th, 1930. 126,002 shares taken up. £30,502 paid, £95,500 considered as paid. Mortgages and charges: £25,000.

Pacific and European Telegraph Co., Ltd.—Capital, £100,000 in £10 shares. Return dated January 13th, 1930. All shares taken up. £40,000 paid (being £4 per share). Mortgages and charges: £66,500.

Metalite Co., Ltd.—Capital, £100 in £1 shares. Return dated December 4th, 1929. All shares taken up. £100 paid. Mortgages and charges, nil.

Vactite Wire Co., (1919), Ltd.—Capital, £25,000 in £1 shares. Return dated December 26th, 1929. 15,000 shares taken up. £3 paid, £14,997 considered as paid. Mortgages and charges, nil.

Ripaults, Ltd.—Satisfaction in full on January 20th, 1930, of charge dated July 29th, and registered August 10th, 1927. (According to the "Register of Mortgages" the registered charge originally secured all moneys, &c.).

Siemens Bros. & Co., Ltd.—Satisfaction to the extent of £34,800 on January 1st, 1930 of charge dated January 15th, and registered January 21st, 1918, securing £1,330,000.

City Notes.

English Electric Co., Ltd.

The necessary resolutions for the reconstruction of the company's finances were passed without dissent at extraordinary meetings of the preference and ordinary shareholders on Tuesday last. In the absence of a quorum the meeting of the 5½ per cent. debenture holders was adjourned for three weeks. The 6 per cent. convertible debenture stockholders approved the scheme on a show of hands, but a poll is being taken to comply with the requirements of the Court. A report of the meeting will appear in our next issue.

London Tramway Companies.

Metropolitan Electric Tramways, Ltd.—The report for the year ended December 31st last shows that the traffic receipts increased by £30,554 to £709,923 and the operating expenses by £32,283 to £693,679. The net receipts were therefore £16,244, to which is added other revenue, making £154,790. After deducting interest, rentals, and other fixed charges, there is a balance of £6,934, which is applied to reducing the deficit brought forward from previous years. The deficiency carried forward is £73,893. During the year further improvements to the rolling stock by the provision of top covers, cross seats, and high-powered motors resulted in a faster and more comfortable service. Two new cars have been built for experimental purposes. Regarding the Order granted to the Middlesex County Council for the construction of a light railway connecting the company's lines at Tottenham with those of the Walthamstow Council, the company has agreed to accept a lease of this light railway, in the event of a new lease of the remaining light railways of the County Council being entered into. Lord Ashfield was elected chairman in place of Mr. E. Garcke, who resigned, and Mr. F. Pick was appointed managing director.

South Metropolitan Electric Tramways and Lighting Co.—The net receipts for the year ended December 31st last were £68,269, an increase of £2,486, and after deducting interest, rentals, &c., providing for renewals and reserve, and adding £11,139 brought forward, £38,790 is available. The directors propose a dividend at the rate of 5 per cent. per annum, leaving £11,790 carried forward. The reconditioning of the rolling stock has been completed and, in addition, 20 cars have been fitted with modern motors. The car-miles run increased by 47,332 to 1,492,840. The sales of electricity rose from 6,845,509 to 8,747,576 kWh, and reductions were made in June last in the electricity charges. Lord Ashfield has been appointed chairman in place of Mr. C. G. Tegetmeier, and Mr. F. Pick is now managing director.

London United Tramways, Ltd.—The receipts for 1929 totalled £469,194, an increase of £15,747, and the net receipts were £65,997 (£5,006 increase), to which was added other income, making £73,573. Interest, rentals, &c., absorbed £56,189, leaving a balance of £17,389, which has been applied to reducing the deficit brought forward to £36,047. The company is promoting a Bill in the present session of Parliament seeking power to provide railless-car services in substitution for the existing tramways.

London and Suburban Traction Co., Ltd.—The revenue for the past year totalled £56,498, and the expenditure was £46,018, leaving £10,480, to which was added a balance brought forward of £36,137, making £46,617, which is carried forward. The report gives the combined results of the above tramway companies and the Tramways (M.E.T.) Omnibus Co., Ltd., which are as follows:—

	1929.	Inc. or dec.
Total passengers carried ...	332,025,650	+8,975,202
Total car and omnibus miles run	35,505,546	+1,003,740
Gross receipts	£2,439,380	+ £34,442
Expenditure	£2,037,604	—
Interest, rentals, and other fixed charges	£235,912	—
Reserves for renewals and contingencies	£105,000	—
Surplus	£60,864	− £34,696

The "Underground" Group.

In our last issue we gave particulars of the dividends declared by the railway companies of this group; we now reproduce the substance of the companies' reports for the past year, which were to be presented at the annual meetings yesterday (Thursday):—

London Electric Railway Co.—The total receipts rose by £57,469 to £2,360,213, and the expenditure decreased by £15,747 to £1,269,084, resulting in an increase in the net revenue of £73,216 to £1,091,129. To this are added miscellaneous receipts and a balance brought forward (£177,151) making £1,455,030. Interest, rentals, &c., contingencies reserve, and preference stock dividend are deducted, leaving £653,181 available. After payment of dividends £186,784 is carried forward. The capital expenditure during the year was £843,293 net, of which £736,502 was for rolling stock. The report refers to the completion of the installation of escalators at Camden Town and Oxford Circus stations. The work of replacing the original rolling stock with rolling stock of the latest pattern is nearing completion and 59 new cars have been added. Reference is also made to the Bill for the extension of the railway to Cockfosters and Northfields, and the construction of new stations. The failure of the Bills for the co-ordination of London passenger traffic to receive Parliamentary sanction is recorded.

Central London Railway Co.—The receipts for the year amounted to £512,410, a decrease of £61,062, and working expenses fell by £9,666 to £179,834, the net receipts being £179,834, as against £231,230. To this is added a balance brought forward of £105,053, and miscellaneous receipts, making £371,823. After deducting interest, rentals, appropriation to reserve for contingencies and renewals, and preference stock dividend, there is available a balance of £258,151. The dividends on the three classes of ordinary stock are paid and £108,151 is carried forward.

Metropolitan District Railway Co.—The traffic receipts totalled £1,605,538 (an increase of £55,210); working expenses were increased by £55,484 to £1,064,010; the net receipts were thus £274 lower at £542,528. After adding miscellaneous receipts and balance brought forward (£44,768) and deducting the usual appropriations, the balance available for dividend on the ordinary stock was £209,858, and after meeting that dividend £48,108 is carried forward. The expenditure on capital account was £512,982, the new office building accounting for £182,450, and rolling stock for £261,339. The capital expenditure during the current year is estimated at £97,000. The new office building at St. James's Park Station has been completed, and the programme for the renewal and reconstruction of the rolling stock is almost completed.

City & South London Railway Co.—The traffic receipts for the year totalled £923,505, an increase of £373, and the expenditure was £536,401, an increase of £20,081, resulting in a decrease in the net receipts of £19,708 to £387,104. To this are added miscellaneous receipts and a balance brought forward (£36,180), making £505,291, and after deducting interest, rentals, appropriation to reserve for contingencies, and preference stock dividend, a balance of £111,708 is available for ordinary stock dividend. This dividend is paid and £37,708 is carried forward. The capital expenditure during the year was £23,763.

Summary of Results.—We reproduce below a comparative statement of the four companies, which, with the London General Omnibus Co., participate in the Common Fund:—

	1929. £	*Inc. or Dec.* £
Traffic Receipts, &c., after the operation of the Common Fund	5,401,666	± 51,990
Expenditure	3,202,071	+ 50,152
Net Receipts	2,199,595	+ 1,838
Miscellaneous Receipts (Net) ...	663,617	+ 3,607
Net Income	2,863,212	+ 5,445
Interest, Rentals, &c.	1,368,830	− 27,506
Balance	1,494,382	+ 32,951
Appropriations to Reserve for Contingencies and Renewals	157,659	+ 50,159
Balance	1,336,723	− 17,208
Dividends on Rent Charge, Guaranteed and Preference Stocks ...	466,977	—
Balance	869,746	− 17,208
Add Balances from last year's Accounts	363,152	+ 34,807
Total amount available for dividends on Ordinary Stocks and Shares ...	1,232,898	+ 17,599
Dividends on Ordinary Stocks and Shares	852,147	—
Rate per cent. per annum	5	—
Balances carried forward to next years' accounts	380,751	+ 17,599

Traffic Figures.—The subjoined table shows that there was a general increase in the volume of traffic:—

Passengers carried—	1929.	*Inc.*
Ordinary	264,337,510	16,549,047
Workmen	65,607,932	3,142,063
Seasons	62,262,000	4,148,414
Total	392,207,442	23,839,524
Number of car-miles run	91,114,113	2,738,886

Underground Electric Railways Co. of London, Ltd.—The accounts for the year ended December 31st last record a total income of £1,182,533, an increase of £28,735 as compared with 1928. The expenses amounted to £69,320 (£1,043 increase), leaving net receipts of £1,113,213 (£27,692 increase). After meeting interest on the debentures and bonds, adding a net amount of £262,466 brought forward, and writing off £10,000 from commission discount, &c., a balance of £847,251 (£137,850 increase) is carried to the balance sheet. The ordinary dividend is paid and £262,504 is carried forward. The report reviews the operating results of the companies in which investments are held, and points out that during the year the operating companies spent £2,315,831 on various improvements and additions. The retirement of Mr. E. R. Peacock from the board, and the appointment of Mr. Evelyn Baring in his place is recorded.

Charing Cross Electricity Supply Co., Ltd.

The directors' report for the year ended December 31st, 1929, shows that the West End Undertakings had gross earnings amounting to £349,127, as compared with £330,571 in 1927. The expenses increased from £184,651 to £214,580, and the net receipts were therefore lower at £134,548. To this a balance brought forward and interest and dividends of £135,176 are added, making £269,724. After providing for debenture interest and sinking fund, paying the preference and standard ordinary dividends, transferring £19,134 to reserve for shareholders' proportion of consumers' benefit, and appropriating £4,021 to co-partners, £87,584 is carried forward. The connections totalled 37,933 kW, and the sales of electricity 32,659,479 kWh.

The City Undertaking's accounts show gross earnings of £364,376 (against £345,939) and a net income of £124,892 (£137,288). A balance of £18,227 brought forward is added together with rent in respect of Bow generating station, &c., £60,944, making £204,062. After providing for debenture interest, &c., the preference dividend, ordinary dividends of 10 per cent. on £350,000, and 7 per cent. on £200,000 are paid, leaving £36,580, of which £31,931 is transferred to reserve for shareholders' proportion of consumers' benefit, and the remainder appropriated to co-partners. The connected load is now 42,733 kW, and sales during the past year totalled 42,431,226 kWh. Meeting: March 5th.

Electrical Distribution of Yorkshire, Ltd.

The accounts for the year ended December 31st last show a profit of £96,482, as compared with £78,281 in 1927. To this is added £21,904 brought forward, making £118,386. From this a dividend of 9 per cent. is paid (4½ per cent. distributed in August last); £17,500 is placed to reserve fund (making £95,000); and £23,657 is carried forward. The number of new consumers connected during the year increased by 7,073 to 35,144. Encouraged by the company's domestic tariff the sales of electricity for this purpose continue to grow. Authority has been received to supply electricity in the urban district of Cudworth and the township of Billingley, and in seven parishes in the rural district of Worksop. In continuation of the company's policy of unification throughout its area, several non-statutory electricity undertakings have been purchased, and consumers in the urban district of Cudworth and the parishes of Askern, Shafton, and Wartley have been transferred to the company's supply. The report records the death of Mr. A. G. Lupton, a director. Meeting: March 4th at Leeds.

Westinghouse Brake and Saxby Signal Co., Ltd.

The annual meeting of this company was held on February 17th, Lord Southborough presiding. In presenting the report and accounts, the chairman, after referring, with regret, to the death of Lt.-Col. M. Cradock, a director, said that the rectifier business continued to increase in volume, and the output had been about three times the amount of last year. Great improvement had been made in the buildings, plant and machinery at the Chippenham works. A well-equipped building now housed the works staff, another was occupied mainly by the rectifier department, and several new additions and extensions were increasing the company's capacity to produce economically. For the first four months of the current year both orders and sales had been high, and the prospects for the remainder of the year were good in the sense that a very large volume of signalling work was to be let by British railways during the next eight months, and the company hoped to obtain its proportion of it. The report and accounts were adopted.

Metropolitan Railway Co.

Presiding at the annual meeting on February 20th, Lord Aberconway (chairman) said that the reconstruction of Swiss Cottage station was completed, and the rebuilding of Great Portland Street station was nearly finished. For Neasden an order had been placed for a further 20,000-kW set to take the place of one of the 5,000-kW sets. The work of installing the new high-pressure boilers, to be operated with pulverised fuel, was proceeding quickly, and it was hoped to obtain some advantage from them in the current year. The Bill which the company was promoting was for the construction of a branch line four miles in length from a point between Wembley Park and Preston Road stations to Little Stanmore. The report and accounts were adopted, and at a subsequent meeting resolutions were passed approving the Bill referred to above and a Bill promoted by the Underground Companies, in which provision is made for the Metropolitan Company and/or the L.N.E.R. Company to enter into an agreement with the promoting companies relating to works at King's Cross, Monument, and Finsbury Park.

Mersey Railway Co.

The annual meeting of this company was held on February 21st. Mr. J. Falconer (chairman), who presided, said that an application by the London, Midland and Scottish Railway Co. for the electrification of the Wirral section of that railway had been approved. The Mersey Railway was in a position, at comparatively small expenditure of capital, and at short notice, to take part in a joint service and deal with all traffic to and from the Wirral area. They had offered to co-operate with the L.M.S. Railway Co., and were awaiting a definite statement of the plans for the electrification of the Wirral section. The report and accounts were adopted.

Stock Exchange Notices.

Dealings in the following have been allowed by the Committee under Rule 159:—

Sidro (Société Internationale d'Energie Hydro-Electrique).—325,000 preference shares of 250 fr. each, fully paid, Nos. 325,001 to 650,000; 67,400 ordinary shares of 1,250 fr. each, fully paid, Nos. 1 to 67,400 (fractional certificates to bearer in respect of fifth shares).

Metropolitan Railway Company.—£2,000,000 new 3½ per cent. "A" debenture stock, issued at £65½ per cent., partly paid and fully paid.

Application has been made to the Committee to allow the following to be officially quoted:—

Turner & Newall.—1,295,666 ordinary shares of £1 each, fully paid, Nos. 3,096,506 to 4,392,171.

Northampton Electric Light & Power Co., Ltd.

The directors' report for the year ended December 31st last shows a total income of £208,718, and a net revenue of £79,127, after providing £48,973 for depreciation. After meeting debenture interest, &c., adding the net balance brought forward (£9,690) and income from investments (£3,209) a sum of £7,000 is carried to reserve. A final dividend of 6 per cent. on the ordinary shares is recommended, making 10 per cent. for the year, as compared with 9 per cent. in 1928, and £9,770 is carried forward. A supply of electricity to Brackley, Buckingham, and a number of villages, was commenced during the year. The maximum load rose to 16,400 kW, and the amount of electricity sold increased from 26,574,837 to 32,949,081 kWh.

Rushden and District Electric Supply Co., Ltd.

The total income for the past year was £28,590, and the net revenue, after providing for depreciation, was £7,696, to which is added a net balance brought forward of £1,250, making £8,946. From this debenture charges are met, income tax is paid, £500 is transferred to reserve, and £500 written off the debenture stock, discount and expenses account. A final dividend of 4½ per cent. is proposed, making 8 per cent. for the year, as for 1928, leaving £1,259 carried forward. The sales of electrical energy increased from 2,256,704 to 3,056,654 kWh.

Kidderminster & District Electric Lighting & Traction Co., Ltd.

The net receipts for 1929 totalled £7,624, as compared with £9,764 in the preceding year, and the net profit was £3,806, against £6,871. A dividend of 2½ per cent. is proposed on the ordinary shares, leaving £576 to be carried forward. The Kidderminster & Stourport Tramway Co. has been liquidated and the company has received £28,465 in respect of its shareholding. The remainder of the commercial investments have been sold, and there is a net loss in the liquidation of the tramway company and sale of investments of £9,380, which has been written off the depreciation and reserve fund.

Lancashire United Transport and Power Co., Ltd.

The traffic receipts for 1929 amounted to £359,329, as compared with £330,576 in 1928, and receipts from electricity sold, &c., amounted to £29,732, making £389,061. The gross profit was £88,785. After meeting expenses, debenture interest, &c., a balance of £19,307 is carried to depreciation account. The report states that it is necessary to make a large allocation to depreciation to provide for the reinstatement of roads when the tramways are abandoned.

Smithfield Markets Electric Supply Co., Ltd.

The report for the year ended December 31st last shows a net profit of £8,073, as compared with £10,778 in 1928, to which is added £2,508 brought forward, making £10,581. The directors propose to pay a final dividend of 5 per cent., making 8 per cent. for the year, as for 1928, and to transfer £3,000 to reserve, leaving £2,781 carried forward. Reductions in the charges for electricity were made during the year, and the output of electricity increased.

Rotax (Motor Accessories), Ltd.

Messrs. Joseph Lucas, Ltd., have presented a petition for an Order of Court enabling them to require the holders of the preference shares of Rotax (Motor Accessories), Ltd., to transfer their shares to the petitioners. At present Messrs. Lucas hold 251,600 shares of the 253,000 issued. The proposed purchase price is £1 3s. 6d. per share, or three Lucas ordinary shares for each ten Rotax shares. The petition is to be heard in London on April 15th.

Turner & Newall, Ltd.

It is announced that the company has acquired the whole of the share capital of the Quasi-Arc Co., Ltd. The latter company has a capital of £400,000, and Turner & Newall propose to create 400,000 new £1 shares and exchange them for Quasi-Arc shares.

Midland Counties Electric Supply Co., Ltd.

The trading profits of the operating companies controlled by this concern rose from £306,510 in 1928 to £349,209 last year, and the balance to the credit of the holding company rose

to £247,842, including £5,676 brought forward. After meeting debenture interest, &c., and placing £16,177 to reserve, it is proposed to pay 7 per cent. on the ordinary shares, against 6¼ per cent. for 1928. The balance of the authorised ordinary capital (£250,000) was issued in November last, at 26s. per share; it is now proposed to create a further 500,000 £1 ordinary shares, raising the capital to £4,500,000. Meeting: March 3rd.

Shawinigan Water & Power Co.

The gross income for 1929 totalled $13,475,863, as compared with $11,562,331 in 1928, and the net revenue, before depreciation, $5,907,979, against $4,848,524. After the usual appropriations, placing $952,002 to reserve, and paying dividends on common shares totalling $2.12½ (against $2.0), $1,314,027 is carried forward.

Charles Clifford & Son, Ltd.

The net profit for the year ended December 31st last was £14,483, and to this is added a balance brought forward making £59,256. The directors propose to place £9,260 to reserve, and pay a final dividend at the rate of 10 per cent. per annum, together with a bonus of 5 per cent., both free of tax, on the ordinary shares, leaving £39,196 carried forward.

Chiswick Electricity Supply Corporation, Ltd.

The accounts for the past year show a net profit of £34,174, against £33,442 for 1928. To this is added £2,653 brought forward, making £36,827. The dividend is maintained at 16 per cent. (8¼ per cent. final), the refund to consumers again absorbs £9,000, and £3,827 is carried forward. Meeting: March 4th.

The Mexican Ericsson Company.

A meeting of shareholders of Mexikanska Telefonaktiebolaget Ericsson has agreed to the board's proposal to increase the share capital by Kr. 10,800,000 to Kr. 21,600,000 by the issue of 60,000 new shares of the nominal value of Kr. 180 each.—*Reuter's Trade Service* (Stockholm).

Metropolitan Electric Supply Co., Ltd.

The final ordinary dividend on the ordinary shares is at the rate of 14 per cent. per annum, making 10 per cent. for the year. The 500,000 shares issued in November last do not participate in the 1929 dividend, but are to receive interest at the rate of 6 per cent. per annum.

Mather & Platt, Ltd.

The net profit for 1929 was £228,398, to which is added £106,006 brought forward, making £334,404. The directors recommend a final dividend of 5 per cent., making 10 per cent., together with a bonus of 5 per cent., both tax free, the same as for 1928, leaving £109,855 carried forward.

Kensington and Knightsbridge Electric Lighting Co., Ltd.

The directors have recommended a final dividend of 10.1811d. per share on the ordinary shares, making the standard dividend for 1929.

Waste Heat and Gas Electrical Generating Stations, Ltd.

The directors recommended a final dividend of 5½ per cent., making 8 per cent. for the year.

Brompton & Kensington Electricity Supply Co., Ltd.

A final dividend of 10.477d. per share, less tax, has been declared, which, with the interim dividend, completes the standard dividend for the year.

Liverpool Overhead Railway Co.

The directors have recommended the payment of a dividend at the rate of 5 per cent. per annum, less tax, on the preference shares for the year ended December 31st last.

Uxbridge and District Electric Supply Co., Ltd.

This company proposes to increase its capital to £450,000 by the creation of 100,000 ordinary shares of £1 each.

French Company.

The *Société Centrale pour l'Industrie Electrique*, Paris, which is a holding company mainly in foreign electricity works, and is closely associated with the Belgian "Sofina," reports net profits of 8.12 million fr. for 1929, as compared with 6.10 millions in the preceding year. It is proposed to pay a dividend of 12 per cent. on the share capital of 60,000,000 fr., against 11 per cent. for 1928.

Swedish Company.

It is stated that the *Allmänna Svenska Elektriska A.B.* has decided to pay a dividend for 1929 at the rate of 7 per cent. after having made provision for depreciation, the net profits being 5.6 million kr., which is the largest amount since 1919. In 1928 the net profits were 4.7 millions and the dividend 6 per cent.

Stocks and Shares.

TUESDAY EVENING.

THE main market in the Stock Exchange in which any genuine disposition can be discovered on the part of the public to invest money, is that devoted to electricity supply and equipment undertakings. Stock Exchange business as a whole is quieter than it has been for many years past. It would appear as though the large capitalist—insurance company, bank, millionaire—is well supplied with money, and is willing to take up gilt-edged stock at any reasonable price. The ordinary man in the street has lost, at all events on paper, a good deal of what he was worth say twelve months ago, and, with the outlook as uncertain as it is, both as regards politics and trade, there is not much inclination on his part to embark on further ventures. Nevertheless, capital is constantly accumulating, and it has to be employed in one direction or another. The chief branch of industry in which anything like hopefulness appears is that concerned with electric power, a consideration which is underlined by the fact that electrical companies are declaring excellent dividends, and that in some cases improvements have occurred where they were not expected. The consequence is that stocks and shares in electrical companies are in demand, prices are firm, and there is optimism with regard to the future.

Money Talk.

Gilt-edged securities have gone ahead on talk of a possible reduction being made this week in the Bank Rate. The Government has offered a new issue of 4½ per cent. conversion stock, the success of whose reception was held to be largely dependent upon monetary conditions. Following upon sharp rises in some of the British Government stocks, the recently-offered North-West Midlands 5 per cent. stock strengthened to 2 discount on the issue price of 98½. Central Electricity Board 5 per cents., which came out as 97½, are quoted at 1⅞ discount.

Tube Railways.

The Metropolitan Railway which recently increased its dividend to 4 per cent. for the year, found a gratifying success in connection with its recent issue of £2,000,000 "A" debenture stock. The lists were closed in advance of the advertised time, and the amount applied for was £2,900,000, according to the statement made by Lord Aberconway at the annual meeting last week. Dealing started in the stock on the basis of the issue price, and, as there were evidently a fair number of stags who wrote for the stock, the latter will have to settle down into the hands of permanent investors before improvement in the price can be expected. The company's ordinary stock has recovered to 64½.

The dividends of the Underground Electric Railways of London group exercised no particular effect upon prices. They had a stimulating influence for about half-an-hour, after which the market turned a little easier: on balance, no changes remained as a result of the week's work. Underground Electric shares keep at 23s., and the income bonds at 108. Districts are steady at 74½. Central London assented ordinary is a good spot at 73 ex-dividend, showing a rise of a point, in addition to the amount deducted for the distribution. The company's preferred assented and deferred assented stand at the same price as the ordinary. The unassented stocks, it may be noticed, are quoted at 71 for the ordinary, 64½ for the preferred, and 77½ for the deferred. There has been a little business doing in London Electric ordinary stock at 73¾, and, were it not for the fact that the market in this is so extremely limited, the price would probably be standing higher.

Tramways.

The London United Tramways 4 per cent. debenture stock holds its last week's rise of 2 points, at 52½; the preference shares, however, drooped to 3s. 6d. London & Suburban Traction ordinary have changed hands this week at 2s. 7½d. The preference continue heavy at half-a-guinea, on the disappointment felt that nothing was said in the report as to a likelihood of the arrears of dividend being dealt with. British Electric Traction deferred is 50 points up, at 1575.

Home Electricity Dividends.

The Metropolitan Electric Supply Company has raised its dividend from 9 to 10 per cent. This came as a surprise, and the price of the shares rose from 38s. 6d. to 41s. 6d., reverting later to £2 middle, which leaves a rise of 1s. 3d. The new shares touched 39s. 3d. before reacting to 38s. 3d. The Northampton Electric Light & Power Company has followed the same course, raising its dividend from 9 per cent. on a smaller capital to 10 per cent. now. The price of the shares has risen to 45s. 3d. The figures are good, and, although at the present price of shares the return on the money is relatively small, there is obvious scope for expansion in revenue and dividend. Moreover, it has been the case for some time past that buyers have been ready to discount the future in the matter of the provincial electric supply companies. The Midland Counties Company is taking power to create half-a-million new £1 shares which will have the effect of raising the total capital to 4½ million pounds. The dividend is advanced to

7 per cent., an increase of 10s. per cent., and the £106,000 set aside for depreciation is £25,000 more than the amount applied to the same fund last year. The report mentions that in the past year Parliamentary powers were obtained to enable two of the traction undertakings to be operated under statutory protection. The shares are 6d. better at 28s. 6d., and the new are 27s. 3d. The St. James' & Pall Mall and the Kensington & Knightsbridge Companies have declared their regular standard dividends.

Prices in the market are firm. Egham & Staines improved to 33s. 3d. Urban ordinary have risen to 33s. 9d. County of London ordinary eased off to 44s. 6d., and this in spite of the expectation that the company may increase its dividend in respect of the past year. It may be that some of the recently-taken block of new shares, not subscribed at the time by shareholders who had the privilege of buying them at a price well below that ruling in the market, have not yet become settled into permanent hands. Shares in the Bournemouth and Poole and other companies associated with the County of London Electric Supply are steady, and there is a pleasant air of expectation about the market. The Electrical Distribution of Yorkshire has declared a dividend making 9 per cent. for the year. The company's expansion of profits and business is again remarkable.

Cables and Wireless.

The major key has to be exchanged for the minor when it comes to discussing the market for Cables & Wireless issues. The Post Office keeps its mouth tightly shut in regard to the arrangement which it is declared to have concluded with the American Telephone & Telegraph Company, or one of its subsidiaries, for the transmission of overseas messages. Halting statements have been made on the subject, none of them, however, being of sufficient definiteness to remove the unfortunate impression that the Post Office is giving preference to a foreign company, instead of utilising the services provided by the Imperial Communications Company, which is a part of the Cables & Wireless merger. In the circumstances, the uncertainty has led to a fresh fall of two points in Cables and Wireless "A" ordinary, reducing the price to 62½. Although the 5½ per cent. preference is quoted nominally at 96, the real figure is not so good, and the "B" ordinary, while remaining in the lists at 30½, is at last a point below this figure. Marconi Marines have been flat, falling 3/16 to 2, from which there was a rally to 2¼. Evidently some of the holders of Marconi Marines are rendered uneasy by the registration of the International Marine Radio Company, an offshoot of the International Telephone & Telegraph Company. Globe Telegraph & Trusts have lost 10s., falling to 21½, although the 6 per cent. preference shares at 11½ show a gain of the fraction. Great Northern Telegraphs remain dull at 30½.

Canadian Marconis provided a little excitement by a jump from 16s. 3d. to 21s. 3d. The demand came from the other side of the Atlantic; over here, there is little more than academic interest now taken in the shares. American Telephones remained at 240 and Internationals at 72½. Anglo-Portuguese Telephones are better at 22s.

Dollar Stocks.

American utility issues are dull. Montreal Light and Power drooped to 140½; Shawinigan shares are 1½ down at 76½; Power Corporation of Canada weakened to 76½; Consolidated Gas & Electric of Baltimore remained at 115. Brazilian Tractions are unchanged at 37½. Amongst Mexicans, the Light & Power Company's common shares fell 3 to 73½. Mexico Tramways common gave way to 22½, but the 5 per cent. bonds at 66½ show a point advance.

Manufacturing Companies.

Movements in the market for the shares in manufacturing companies are few. There was a fall of 10s. in Telegraph Constructions. Shares in the other electrical and cable equipment companies are steady. British Aluminium ordinary have fallen a further 1/16 to 43s. 3d. Associated Electrical ordinary at 26s. 6d. are a shilling down, and it is said that the selling of these shares comes from America. It may be asked how anyone can tell the origin of orders, either to buy or sell, in view of the fact that members of the Stock Exchange never disclose the names of their clients when dealing. There are firms, however, who are known to have considerable American connections, and, if changes in price occur through operations of these firms, the assumption is that the orders emanate from what is called the other side. The same applies, of course, to people who are known to be in close touch with Paris, Brussels or other centres. Obviously, this deduction may at times be wrong, though in the majority of cases it is quite justified.

Babcock & Wilcox receded to 3, which gives a yield of the round 5 per cent. on the money at the present price. The iron, steel, and allied market is in a comatose condition. There has been a little more inquiry for rubber shares, owing to the agreement reached between British and Dutch interests in regard to a mild form of tapping restriction, and, in consequence of this, speculative purchases have been made in a market that is bare of shares. Ever-Ready shares firmed up to 18s. 6d. Telephone Manufacturing Rentals remain at 3s. 7½d.; the "1929" shares are quoted at ninepence each.

Share List of Electrical Companies.

HOME ELECTRICITY COMPANIES.

	Nom.	Approx. Dividend. 1927.	1928.	Price Feb. 25 1929.	Rise or fall	Yield p.c.
	£					
Bournemouth and Poole	1	15	15	8½	—	4 18 0
Brompton Ordinary	1	8½	8½	25/6	—	5 9 10
Charing Cross Ordinary	1	8½	8½	26/-	—	5 7 8
do. do. 4½% Pref. ...	1	4½	4½	17/-	—	5 6 0
Chelsea	1	8¾	8¾	25/-	—	5 12 0
City of London	1	10	10	89/-	—	4 7 6
do. do. 6% Pref.... ...	1	6	6	22/6	—	5 6 8
Clyde Valley	1	8	8	35/9	—	4 8 3
County of London	1	7	10	44/3	—6d.	4 10 0
do. do. 6% Pref.... ...	1	6	6	22/6	—	5 6 8
Edmundson's 7% Pref.	1	7	7	34/-	—	5 16 5
Elec. Supply Corporation	1	11	11	47/-	—	4 13 7
Kensington Ordinary	1	8	8	26/-	—	5 7 8
Lancs. Light and Power	1	7½	7½	37/-	—	5 11 1
London Electric	1	8½	9	26/6	—	5 5 8
Metropolitan	1	9	10	32/-	+1/16	5 6 0
do. 4½% Pref.	1	4½	4½	17/-	—	5 6 0
Midland Counties	1	6½	7	28/6	+3d.	4 18 3
Mid. Elec. Power	1	15	8	32/6	—	4 18 6
Newcastle-on-Tyne Ordinary ...	1	6	6	23/9	—	5 1 1
do. 7% Pref.	1	7	7	35/6	—	5 9 10
Notting Hill 6% Pref.	10	6	6	10¾	—	5 11 4
North Met. Elec. 6% Pref.	1	6	6	22/-	—	5 9 1
St. James' and Pall Mall	1	8	8	26/6	—	5 5 8
Scottish Power	1	8	8	29/-	—	5 6 8
South London	1	8½	8½	26/6	—	5 4 10
Urban Ordinary	1	7	7	33/9	+1/16	4 2 10
Westminster Ordinary	1	8½	8½	25/6	—	5 9 10
Whitehall Elec. Invst. 7½% Pref. ...	1	7½	7½	34/-	—	5 5 0
Yorkshire Elec.	1	8	8	32/-xd	—	5 0 0

HOME RAILS.

Central London Ord. Assented ...	Stock	4	4	78xd	+2½	5 9 7
Metropolitan	"	3½	4	64½	+⅛	6 4 0
do. District	"	4	5	74½	—	6 16 2
Underground Electric	£1	7	8	23/-	—	6 19 2
do. do. Income ...	Bonds	6	6	108	—	5 11 1

TELEGRAPHS AND TELEPHONES.

Anglo-Am. Tel. Pref.	Stock	6	6	102½	—	5 17 1
do. Def.	"	1½	1½	24½	—	6 4 0
Automatic Telephone	1	10	12½	87/6	—	6 13 4
Cables & Wireless 5½ Pref.	Stock	—	—	96	—	5 14 8
do. A 7½ Ord.	"	—	—	62½	—2	... ...
do. B Ord.	"	—	—	30½	—	... ...
Globe Tel. and T. Ord. ...	10	10	10	21½	—½	*4 13 0
do. do. Pref.	10	6	6	11⅛	+⅛	5 7 10
Great Northern Tel.	10	20	20	30½	—	6 11 2
Marconi-Marine	1	12½	15	2¼	—1/16	... ...
Oriental Telephone Ord	1	12	12	9½	—	*4 5 5

HOME AND FOREIGN TRAMS, &c.

Anglo-Arg. Trams First Pref. ...	5	5½	5½	3 1/16	—	8 19 6
do. do. 2nd Pref. ...	5	6	6	3 1/16	—	9 16 0
do. do. 5% Deb. ...	Stock	5	5	79½	—	6 16 1
British Electric Traction Def. Ord.	"	5	5	157/5	+5d	... ...
do. do. Pref. Ord.	"	8	8	124½	—	6 8 6
Brazil Traction	100	7	8	37½	—	5 6 8
Brit. Columbia Elec. Rly. Pref. ...	Stock	5	5	90½	—	5 10 6
London & Sub. Trac. 5% Pref. ...	1	Nil	Nil	10/6	—	... ...
London United Tram Deb. ...	Stock	4	4	59½	—	7 12 4
Mexico Trams, 5% Bonds	—	5	5	66½	+1	7 10 5
Mexican Light Common	100	Nil	Nil	73½	—3	... ..
do. 7% Pref.	100	7	7	71¼	—	9 15 10
do. 1st Bonds	—	5	5	72½	—	6 18 0
Victoria Falls Ord.	1	15	15	2 1/16	—	5 2 0
Yorkshire (West Riding)		Nil	Nil	6/-	—	... ...

MANUFACTURING COMPANIES.

Assoc. Elec. Ord.	1	6	—	26/3	—1/-	4 10 7
Babcock & Wilcox	1	18	15	3	—1/16	*5 0 0
British Aluminium Ord.	1	10	10	43/3	—1/16	*4 12 6
British Elec. Transformer Pref. ...	1	7	7	10/-	—	... ...
British Insulated Ord.	1	15	15	8¾	—	8 17 4
Brush Ord.	Stock	10	10	136½	—	7 18 1
Callenders	1	15	15	3¾	—	4 0 0
do. 6½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Parkinson Ord.	£/-	—	90	21/6	-	6 19 6
do. 8% Pref.	1	8	8	35/-	—	6 8 0
Edison-Swan 1st Pref.	1	7½	7½	34/6	—	7 1 2
do. 5% Deb.	Stock	5	5	84½	—	5 18 4
Electric Construction	1	7½	5½	15/-	—	7 6 8
Enfield Cable Ord.	1	90	90	4¾	—¼	4 2 0
English Electric	1	Nil	Nil	8/9	—	... ...
do. do. Pref.	1	8	Nil	7/8	—	... ...
Gen. Elec. Pref.	1	6½	6½	24/-	—	5 8 4
do. Ord.	1	10	10	3 1/16	—	4 6 7
Henley...	1	25	20	6 1/16	—	4 18 8
do. 4½% Pref.	5	4½	4½	4¼	—	5 6 0
India-Rubber	1	Nil	Nil	11/3	—	... ...
Johnson & Phillips	1	10	—	36/3	—	5 10 3
Siemens Ord.	1	7½	7½	25/-	—	6 0 0
Telegraph Construction	12	10	10	16½	—½	*4 10 6

*Dividends paid free of Income Tax.

Our Foreign Electrical Trade.

Electrical Exports and Imports during January.

THE Board of Trade returns of exports from and imports into this country during January show that so far as trade generally was concerned the year opened with a slackening in both directions. The electrical trade, however, was not influenced by this general tendency, for both exports and imports showed an increase as compared with January, 1929. Unfortunately, the imports increased to a much greater extent although they failed to regain the high level (£1,007,423) recorded in October last.

The rise in the export total as compared with the preceding month was not very remarkable, although some of the items showed fairly large variations. The greatest occurred in the case of submarine telegraph and telephone cable in which there was a substantial fall of £63,845. This was nearly balanced by an increase of £61,874 in exports of unenumerated electrical machinery. Insulated wires and cables showed a satisfactory increase (£47,257), and batteries and accumulators also advanced, by £13,883. The total exports of railway and tramway motors and "other motors and generators" fell by £21,346, while exports of telegraph and telephone apparatus declined by £10,018. In comparing the figures with those for January, 1929, it will at once be seen that a large rise in the telegraph and telephone section as a whole (£122,817) was partly offset by a decrease of £84,994 in the machinery section. In this comparison, too, insulated wires and cables, and batteries and accumulators showed substantial increases.

In the import total there was not much change as compared with December. The largest item in the list was meters and instruments which, at £226,331, showed a rise of £83,767. Imports of this class are overwhelmingly greater than the exports. Against this increase there were fairly large falls in several classes, including £13,104 in the case of electrical machinery. The increase in the import total as compared with January last year was over 50 per cent. For this meters and instruments, which rose by £204,792, were mainly responsible. Glow lamp imports were more than trebled and several other items were considerably higher.

The re-export section showed increases in both comparisons due almost entirely to larger shipments of batteries and accumulators.

The following table is an analysis according to markets of our electrical machinery exports during January; the corresponding figures for January, 1929, are given for purposes of comparison :—

Destination.	Jan., 1929. £	Jan., 1930. £	Inc. or dec. £
European countries ...	108,820	141,626	+32,806
Japan	97,158	4,707	−92,451
South America ...	39,186	55,614	+16,428
South Africa ...	41,522	69,660	+28,138
British India ...	135,095	88,238	−46,857
Australia	92,230	79,620	−12,610
New Zealand ...	23,503	26 337	+ 2,834
Canada	29,313	25,267	− 4,046
Other countries ...	96,612	87,376	− 9,236
Totals ...	£663,439	£578,445	−£84,994

The fall in the case of Japan appears serious but actually last year that country increased its share of our machinery exports and so the present decrease may only be a temporary one. On the other hand, the decrease in the Indian figure appears to be a continuation of the downward movement which set in last year. The increase in shipments to South America is encouraging in view of the substantial fall which occurred in 1929.

	Exports.			Imports.			Re-Exports.		
	Electrical exports for Jan. 1930.	Inc. or dec. as compared with Dec. 1929.	Inc. or dec. as compared with Jan, 1929.	Electrical imports for Jan, 1930.	Inc. or dec. as compared with Dec, 1929.	Inc. or dec. as compared with Jan, 1929.	Electrical re-exports for Jan, 1930.	Inc. or dec. as compared with Dec. 1929.	Inc. or dec as compared with Jan 1929.
Electrical goods and apparatus (unenumerated)	£283,015	+ £5,542	+ £25,191	£157,234	− £37.137	+ £26.9:.7	£11.897	−£2,044	+£6,980
Insulated wires and cables ...	328,042	+ 47,257	+ 54 737	97,998	+ 5 895	+ 21,547	695	+ 285	+ 214
Glow lamps	57,330	+ 62	+ 3,968	74,298	− 12,500	+ 51,971	1,116	+ 100	+ 370
Arc lamps and parts ...	1,966	− 184	+ 140	2,459	+ 939	− 1 673	—	— 55	− 20
Batteries and accumulators ...	87.928	+ 13,883	+ 19,860	59 615	− 16,370	+ 4 106	15,927	+ 15.338	+ 15,552
Meters and instruments ...	27,821	− 460	− 2,998	226 331	+ 83,767	+ 204,792	1,031	+ 669	− 79
Carbons	885	+ 380	− 10	19,252	+ 7,969	+ 6,081	36	+ 14	− 47
Switchboards (not telegraph or telephone)	3.761	− 813	− 7,961	46	− 196	− 173	—	— 14	—
Electrical Machinery—									
Electrical machinery (unenumerated)	340,329	+ 61,874	− 10,682	178,351	− 13,104	+ 21,697	8,083	− 4,077	− 883
Railway and tramway motors	11,414	− 5,422	− 14,214	—	—	—	—	—	—
Other motors and generators...	226.702	− 15.924	− 60 098		—	—	—	—	—
Telegraph and Telephone Cable and Material—									
Telegraph and telephone wires and cable (not submarine)	98,497	+ 280	+ 31,355	4.502	+ 3,062	+ 721	—	—	− 5
Submarine telegraph and telephone cable...	20.495	− 63,845	+ 8,279	—	—	—	—	—	—
Telegraph and telephone instruments and apparatus ...	257,836	− 10,018	+ 83,183	102,142	− 11,640	− 11,893	8,293	+ 4,808	+ 4,818
Totals	£1,745,051	+ £33,171	+ £130,750	£922,228	+ £10,685	+£324,133	£47,078	+£15,024	+£27,100

The British Industries Fair.—III.

Some Notes on the Exhibits, Visits, and Functions at London and Birmingham.

THE official reports as to the attendance, the actual business done, and the number of trade inquiries received at the " heavy " section of the British Industries Fair at Castle Bromwich, Birmingham, are very satisfactory. They are the more convincing by reason of restraint in tone.

The attendance for the first week was a record in the history of the undertaking, and on Saturday last, which was " public day " (cheap facilities having been afforded to works parties), the attendance was approximately 40,000. This was 12,000 more than on the corresponding day of last year.

Credenda Conduits Co., Ltd.

George Bray & Co., Ltd.

British Thomson-Houston Co., Ltd.

A View of the Electrical Kitchen.

Some Stands and the Electric Kitchen at Birmingham.

As might have been expected in an exhibition in which the diversity of manufactured products is so great, the business experience of standholders naturally varied considerably, but on the whole, it would appear that the trade position was satisfactory. This view is based entirely on exhibitors' reports supplied to the Birmingham Chamber of Commerce, which is responsible for the organisation and control of the Section.

Very good purchases, covering a wide range of products, including hardware, varnishes, enamels, and small machine tools, were made on behalf of South Africa, and in a somewhat lesser degree for New Zealand. The Australian trade shows rather more evidence of revival after the recent lull, but the Indian market remains disappointing.

A more confident note characterises the Canadian trade, despite the advantages which the United States enjoys by reason of close proximity to the Dominion, and the fact that many American manufacturing houses have established factories and depôts there. Mr. John Belliss, vice-president of the Birmingham Chamber of Commerce, who recently made a business tour in the Dominion, declared at a launcheon at the Fair that four or five of the leading British electrical manufacturers of this country were doing a very satisfactory business in power plant and general accessories.

The trade reports from the electrical section were most encouraging; and whilst actual buying of heavy engineering equipment was hardly so good as last year, the number of inquiries appeared to be about up to the average, some large crude oil engines, electrical power plant and heavy presses sold at the Fair are to be shipped to India, South Africa, Australia and Burma.

As showing what may be called the continuing influence of the Fair in trade, it may be mentioned that a firm took an order for a conveyor, for which specifications and other particulars were supplied at the Fair, 1926.

We are pleased to state that our own participation in the Fair this year has had most gratifying results. It

has given us an opportunity of meeting a large number of friends in the industry, and we have been able to render useful service to them in a number of directions.

In our last issue we reported the appointment of a Government Committee to consider what means could be adopted to increase still further the utility of the Fair to British trade. The points which the Committee will investigate and report upon will include the following:—The possibility of extending the scope of the Fair; the date on which the Fair is to be held, and the desirability of holding a second Fair in the autumn; the limitation of participation to manufacturers; the best means of advertising the Fair at home and abroad, and of financing the publicity campaign, with reference to the possibility of raising the money by an addition to the charge for space; the possibility of holding the Fair, or sections of the Fair, at centres abroad; and the possibility of organising a travelling Fair either in ships or trains. The secretary of the Committee is Mr. A. R. Fraser, M.B.E., D.O.T., 35, Old Queen Street, S.W.1.

We reproduce herewith photographs of some of the stands at Birmingham and also a view of the electric kitchen briefly described in the opening notes on the Fair in our issue of February 14th (p. 315).

The building erected by the British Electrical Development Association formed a convenient rendezvous for electrical exhibitors and their visitors, being well-placed in the centre of the Electrical Section.

An Electrical Day at the Fair.

There was a large attendance of representatives of the electrical industry at the Birmingham Section of the British Industries Fair on Thursday last week.

During the morning a conference under the auspices of the British Electrical Development Association was held in the new Bradford Buildings, and an interesting paper on "Electric Heating for all Purposes, with Special Reference to Water Heating," was read by Mr. R. Alan S. Thwaites, of the Yorkshire Electric Power Company. Lieut.-Col. W. A. Vignoles, director and secretary of E.D.A., presided.

Among the bodies represented were the Institution of Electrical Engineers (Council), the Incorporated Municipal Electrical Association, the British Electrical Development Association, the Incorporated Association of Electric Power Companies, the Provincial Electric Supply Association, and the Municipal Tramways and Light Railways Association. These bodies were entertained to lunch in the Bradford Room.

Mr. T. R. MARTIN, chairman of the Advisory Committee of the Electrical Section of the Fair, extended a welcome to the delegates, and pointed out that the amenities of the Fair had been greatly improved this year. Every facility was afforded, he said, for the holding of conferences, and he hoped that such gatherings would become an integral part of the Fair.

In the name of the Corporation of Birmingham, Mr. E. J. JENNINGS, commercial manager and secretary of the Electric Supply Department, also offered a welcome, hoping that the deliberations of the conference and a tour of the exhibition would be of advantage to the industry and to the representatives present individually. Mr. Thwaites then read his paper, which with the ensuing discussion, is dealt with elsewhere in this issue. Both the paper and the discussion brought forward a number of valuable and interesting suggestions.

The E.D.A. Kiosk at Birmingham.

The Luncheon.

Mr. T. R. MARTIN presided at the luncheon to the electrical visitors, and gave the toast of the industry in a speech of welcome. He said that many exhibitors, and some of those on the Fair Management Committee, felt that perhaps the time of holding the Fair was not a time calculated to get the best results, especially as regarded overseas visitors. That was a matter in which the organisers of the Birmingham Section had had no jurisdiction, but it was a matter which would doubtless come within the purview of the Committee just appointed by the Government to inquire into the Fair. Regarding the electrical industry, Mr. Martin said that in it the country possessed a social service destined above all others to play a vital part in the domestic comfort and convenience of the country. There were few things wrong with the electrical industry to-day that could not be put right by effective co-operation within the ranks of the industry. Mr. Martin expressed the thanks of the organisers of the Fair to the Electrical Advisory Committee for their co-operation and assistance throughout the year, and for the indefatigable work of the honorary secretary, Mr. Jennings.

Lieut.-Colonel T. EDGCUMBE, past president of the Institution of Electrical Engineers, responded, in the absence of Sir Thomas Purves, the President. He said that if industry generally was prosperous, the people were prosperous: if industry was in a bad way, down went the standard of living. Industry was the only thing that really created wealth. The only way to deal with unemployment was to put people on useful work. It was of no use giving them unremunerative work. When he suggested in his presidential address eighteen months ago that the way to improve employment was to induce people to buy British goods, the orthodox economists held up their hands in horror that anyone should suggest interfering with what they called free interchange of goods, entirely overlooking the fact that under our present fiscal conditions we had anything but a free interchange of goods. He thought everyone was now coming round to the view he had outlined, from the Prime Minister downwards, and it was merely a question of the way to do it.

Alderman W. WALKER, a member of the Central Electricity Board, who also responded, said that producers of electricity could not proceed on their own. They were making strenuous attempts to get the domestic load increased as rapidly as possible, and they were having very fine results, but they depended very largely for successful results on the manufacturers giving them appliances which were absolutely reliable to place in the hands of the unskilled domestic user at a price that would tempt more and more people who were potential users. The enormous housing schemes in the country had given them a set of customers of whom they never dreamt a few years ago, but many of the people in those houses had not much capital for expensive things like cookers. He urged that they should standardise sizes and parts in order than there should be a considerable reduction in the price. On the supply side developments were taking place extremely rapidly. The Central Board schemes had been got out with great facility. Friction would occur in the operation of such gigantic schemes, but, so far as experience went, they believed that the technical difficulties were being mastered, and they could look upon supply from the Grid as being successful and reliable.

The E.P.E.A. Visit.

Speaking at a luncheon to a large gathering of members of the Electrical Power Engineers' Association at the Birmingham Section on Saturday last, Mr. G. N. GUEST, deputy-chairman of the Fair Management Committee, in proposing the toast of "Our Guests," pointed out that one of the difficulties of manufacturers at the present time was with regard to overhead charges. The value of cheap electricity for power and lighting could not be exaggerated. The value of our imports was £380,000,000 in excess of the exports, and while he was against anything in the nature of newspaper "stunts" in the creation of a new political party, he thought the time had arrived when something should be done to remove the injustice to manufacturers of the present import system.

The toast was replied to by Mr. A. V. SENDELL, president of the Electrical Powers Engineers' Association, who expressed the opinion that cheaper electricity was bound to come, having regard to the increased efficiency of generating stations. As showing their faith in the British Industries Fair they had had a stand every year in the Fair. To-day the British manufacturer of electrical appliances was providing for the small consumers cheap, sturdy, strong, well insulated products. The speaker had a strong belief in the utility of conferences among the technical groups; by this means they would get to know precisely what was wanted in the various sections of the industry.

A private conference of members of the Association followed.

Some of the Exhibits.

A Third Instalment of Illustrated Notes.

W. H. Allen, Sons & Co., Ltd.

This company is showing two examples of the "Allen" airless injection Diesel engines, one capable of developing 100 b.h.p. and the other 200 b.h.p. The smaller of these is running direct-coupled to a d.c. dynamo. The 100-b.h.p. engine is representative of a range of engines which is made

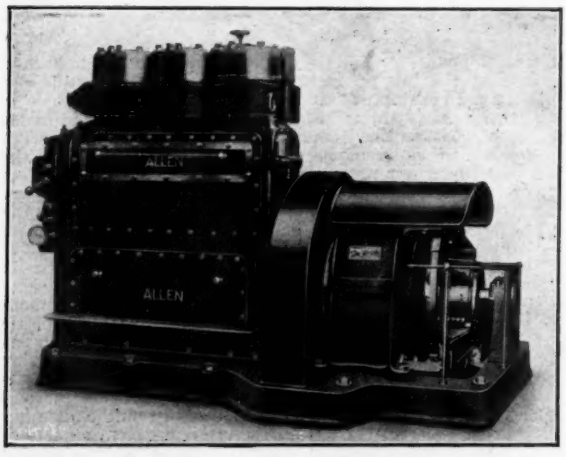


Fig. 32.—An "Allen" Airless Injection-type Engine.

with from two to six cylinders, the outputs ranging from 65 b.h.p. to 200 b.h.p., the speed in each case being 500 r.p.m. The engine exhibited, which is illustrated in fig. 32 with its dynamo, is of the 3-cylinder type and is exceedingly compact, the space occupied being only 7 ft. 8 in. long by 4 ft. 2 in. wide, the overall height being 6 ft. The dynamo is of the a.c. multi-polar, open type, designed for continuous working without injurious heating, sparking, or undue wear of the commutator or bearings. It has a capacity of 65 kW and is of the compound wound type arranged for 220 V. A substantial cast-iron baseplate is provided to carry both the engine and the dynamo. These engines are of the vertical, 4-stroke, airless injection type and start at once from cold without the use of any blow lamps, cartridges, electrical device or other external source of heat, the compression pressure being about 430 lb. sq. in., which is sufficient to ensure ignition of the charge under all conditions of running. The larger engine is representative of the range of engines of this type with from two to six cylinders from 130 b.h.p. to 750 b.h.p. output. The particular engine shown is designed for a speed of 400 r.p.m. and is also of the vertical, 4-stroke type, arranged for starting immediately from cold. It is exhibited direct-coupled to a d.c. dynamo similar to the one described above but with a capacity of 132 kW. In both engines attention has been paid to the question of filtration of both the fuel oil and the lubrication oil supply, dual type filters being provided in each system. The fuel consumption does not exceed 39 lb. per b.h.p.-hour at full loads when using a standard grade Diesel oil having a calorific value of approximately 18,500 B.th.u. per lb.

Other exhibits include a 2-cycle type heavy fuel oil engine rated at 15 b.h.p. when running at 450 r.p.m. and two examples of the "Allen Conqueror" pump.

British Hanovia Quartz Lamp Co., Ltd.

This company is showing its quartz lamps, and in addition to lamps for sunlight treatment for medical use, its display includes smaller models for health sunbaths, and special lamps for industrial use. The exhibit includes the "Alpine Sun," for medical use, the "Homesun" lamp for home use, which is easily portable, and is made for any standard voltage, and the "Analytic" lamp for industrial use. One of the interesting applications of this lamp is in fluorescence tests, which give an immediate indication of the chemical composition and grade of test substances. It has also found extensive use in banks and Government departments for the detection of forgeries. The lamp facilitates these tests by its output of invisible ultra-violet rays, passed through a special filter. It can also be applied for the unfiltered radiation used in rapid durability tests of varnishes, fabrics and materials.

Geo. Bray & Co., Ltd.

The display on this stand, which is depicted on p. 410, includes "Chromalox" heating units, both in the form of separate strips and rings and as the heating element in boiling plates, immersion heaters, radiators, car heaters, &c., and appliances made by various manufacturers using these elements are shown. Other exhibits include the Bray lampholder in various patterns and finishes, and a comprehensive display of electrical porcelain and steatite insulators, showing many types of both vitreous and refractory insulators.

H. E. Ashdown (Birmingham), Ltd.

This company is showing a comprehensive range of Bakelite mouldings and stampings, and a range of its latest Bakelite accessories.

Shropshire, Worcestershire, and Staffordshire Electric Power Co.

The stand of this company serves as an information bureau, where information can be obtained regarding electricity supply, vacant factories, sites, &c., throughout an area of approximately 2,500 sq. miles, which includes practically the whole of Worcestershire and portions of the counties of Shropshire, Staffordshire, Warwickshire, Gloucestershire, &c. Efforts are being made to encourage rural development of electricity.

Ruston & Hornsby, Ltd.

The exhibits of this company include a 10-b.h.p. petrol paraffin engine, a compact unit for small factory or country house lighting, &c. There is also a cold starting airless injection type of oil engine, capable of running on cheap fuel oil and rated at 22 b.h.p. Another example of modern oil engine practice is a 3-cylinder vertical engine working on the Ruston principle of airless injection. An interesting accessory provided with the vertical engine is the patented stream line filter, fitted to economise in lubricating oil, which is filtered and used over and over again. Both these airless injection engines start from cold, and run on crude oil. An air compressor is shown which is run primarily for the purpose of providing compressed air for starting up the above oil engines. This is a single stage compressor which starts on petrol and afterwards runs on either petrol or paraffin and is capable of giving a maximum air pressure of 300 lb. per sq. in. It has a capacity of 10.6 cu. ft. of free air per minute at 560 r.p.m. Other exhibits include a crude

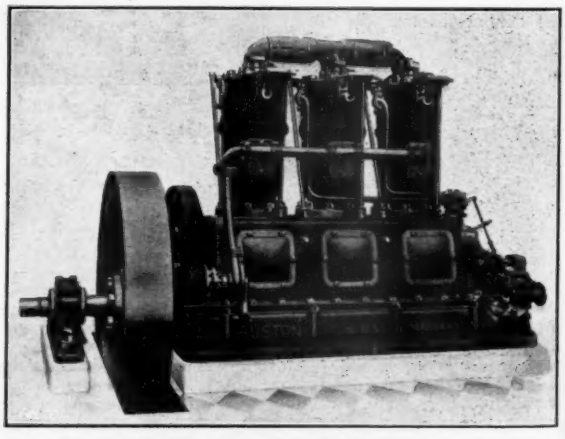


Fig. 33.—A Ruston Oil Engine.

oil road roller, and the first engine sent out from the company's works. This is a 9½ b.h.p. engine which has been in constant use since 1892. The accompanying illustration (fig. 33) shows the 3 VXA type of oil engine which is being exhibited by the company.

British Engineering Standards Association.

This Association has available at its stand copies of the British Standard Specifications which have been prepared by the various sections of its organisation.

Vac-Tric, Ltd.

This company shows and demonstrates a number of models of its vacuum cleaners. These are of both vertical and horizontal (enclosed bag) patterns, and are equipped with a full set of accessories.

Carron Company.

Included in the exhibit of this company is a varied selection of its cooking and heating appliances. The display includes the newest cookers representing two types. In the "M" series many unique features are incorporated in the design, the chief essentials being all-vitreous-enamel finish inside and out, all interior fittings and parts also being enamelled by this process, to withstand the ravages of corrosion, moisture, and continual use over many years. Side and bottom heated detachable oven interior, extra large warming chamber, bus-bar wiring, cast-iron fuse box, cam lever door handle, carefully bedded and fitted joint between oven door and body, and "Sadia" fast boiling plates, fitted as standard, are features of the construction. Fuses of the "Triumph" type housed under the enamelled plate, and a side hinged hob, allow access to all connections even when the cooker is situated in a confined space. The P.2 cooker on view in many ways resembles the No. 310 Carron cooker, but, while retaining certain important characteristics, the entire cooker has been re-designed and brought into line with modern standards and requirements. A range of fires in a variety of finishes are shown, representative of the company's four series—"Carreflex," "Cathedral," "Stella," and "Carcole." An automatic kettle is shown for the first time embodying original features to ensure that it will not boil dry under any circumstances. The automatic switch comes into operation when the temperature of the control gear has risen to about 80 deg. above boiling point. Irons are also displayed, some being in coloured enamel. Examples of Carron cooking apparatus for hotel and institution use are also displayed and these have all-enamelled exteriors.

Henry Marsh & Co.

Some attractive lighting fittings were to be seen on this firm's stand. A notable range comprised lanterns with glass panels bearing sandblasted and sprayed designs. Another series of lanterns in "Marbleoid"—a flexible, non-inflammable material with a marble finish—also appeared on the stand. Other lighting fittings shown included floor and table standards and silk shades. A variety of domestic appliances formed a part of the display, among them being kettles, bowl fires, toasters, and irons. The toasters have a sliding top plate giving access to the connections, and a feature of the irons is the rounded sole plate. In another section tumbler switches, lampholders, ceiling roses, and other accessories were shown.

Rycroft & Co., Ltd.

The principal electrical exhibit on this stand was the "Rycolectric" water-heating apparatus which, incidentally, afforded a further indication of the increasing use of "Chromalox" elements Both "express" and storage models were on view. The storage model consists of a lagged copper cylinder in which there is a separate chamber for the immersion-type heater (1½ or 3 kW), from which two tubes pass upward to near the top of the cylinder. The incoming water is heated in the chamber and passes through these tubes, which are well insulated to avoid heat loss, and the hot water can be drawn off from the top as required. A thermostat is fitted at the base to maintain the temperature at a given level. The heating element can be withdrawn without emptying the tank. The standard "Rycolectric" tank has a capacity of 15 gallons. There is also a 5-gal., 1-kW "Junior" model. The "Express" pattern employs a flat oval "cylinder," which can be fitted flush to a wall. It operates on the displacement principle and is fitted with a ball valve to prevent overflowing. The company also produces a hot-water radiator in three sizes (¾, 1 and 1½ kW), fitted with three-heat switches. These are all 30 in. high, but vary in length from 17 to 33 in.

Thermo Path Co., Ltd.

This company is again exhibiting its "Meracol" fires. The distinctive feature of these is the concealment of the element behind a metal shield, the element being placed in a position to give the greatest efficiency. A notable development is a fire with a 17 in. diameter reflector and a loading of 1 or 1.5 kW. Examples of the fire in screen form are shown, and there are also models of bar-type fires in which the elements are fitted in aluminium-alloy troughs.

British Vacuum Cleaner & Engineering Co., Ltd.

This company is exhibiting several types of its vacuum cleaners, electric and non-electric, including the "Goblin" de luxe electric cleaner. The motor and turbine unit of this cleaner is suspended in rubber, thus ensuring complete electrical insulation and reducing noise and vibration to a minimum. A feature is the new "Agitator" carpet nozzle, with swivel coupling, which allows easy cleaning under low furniture, and is fitted with a device for removing cottons, dog hairs, &c. Another interesting exhibit is the "Turbinet" No. 3 portable turbine vacuum cleaner and blower for business premises, offices, &c. The air exhauster is a four-stage turbine of special design displacing a large volume of air at a high velocity, and is direct coupled to a ¾-h.p. electric motor. An extension of the turbine in the form of a cylindrical metal case encloses a fabric bag which intercepts and holds the dust. When the machine is used for vacuum cleaning, the hose is inserted in the hole in the cover and the tool required is attached to the other end of the hose or tool hand as may be required. For blowing, the suction hose is transferred to the exhaust fitting at the back of the machine, the inlet on the front being open, or the cover removed to admit air freely. The cleaner weighs 56 lb. and can be supplied for 100/120 or 200/250 V d.c. and for a.c. at similar voltages, 40/60 cycles, single-phase.

Tangyes, Ltd.

This company is showing a number of its oil engines, including a 144-b.h.p. twin cylinder heavy oil engine, a 19-b.h.p. fuel oil engine driving the dynamo for lighting the stand and a 6-b.h.p. fuel oil engine driving a vertical treble

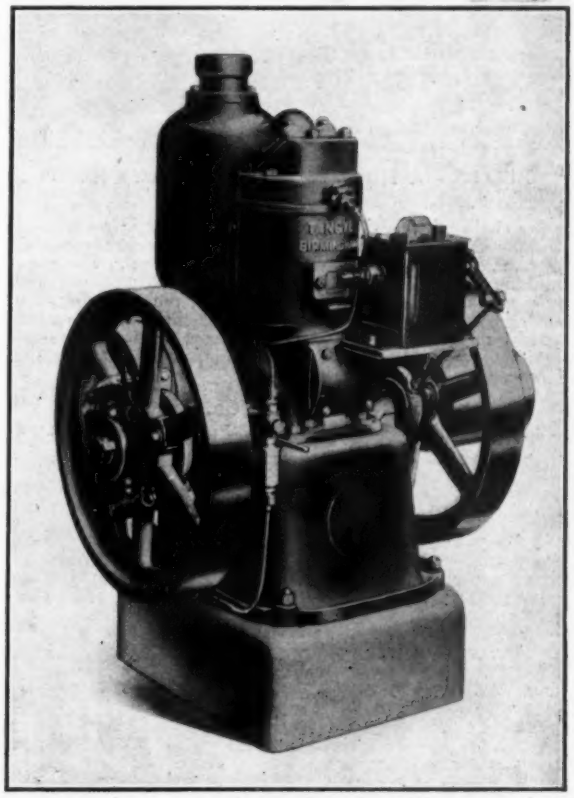


Fig. 34.—A Two-stroke Vertical Oil Engine.

ram pump. Several of the company's new design of two-stroke vertical oil engines (fig. 34) are shown. Other exhibits are vertical treble-ram pumps, a two-stage horizontal turbine pump, and a range of lifting tackle.

Charles Joyner & Co.

Many of the firm's fires are to be seen on this stand. Of particular note are those finished in chromium plate. A range of new water heaters is shown, the construction of which is such that a small quantity of hot water for immediate use can be obtained, before the bulk of the water is heated. The "Angelus Empire" cooker again appears. This met with success in the Dominion markets, as it was especially designed for their requirements. The "Angelus" cookers are provided with detachable ovens and bus-bar wiring. The elements are so fitted as to avoid any chance of breakage on account of expansion or contraction. The thermometer graduations are actually printed on the doorplate, which makes reading an easy matter. The enamel finish of these cookers, inside and out, is very noteworthy.

Thos. de la Rue & Co., Ltd.

"Telenduron" insulating material in a variety of forms is the principal subject of this exhibit. Many types of accumulator boxes are shown as well as numerous examples of electrical and radio components. The company has recently secured large orders for third-rail insulators for use overseas, and some of these appear on the stand. One particularly neat moulding takes the form of a telephone hand set. The company supplies mouldings to a large number of electrical firms.

Pneulec, Ltd.

Since the previous Fair this company has made two additions to its foundry equipment manufactures and these are demonstrated on its stand. One machine is a high-speed electric swing frame grinder (illustrated in fig. 35), and is a development of the earlier Pneulec machine. This new machine is produced to meet the requirements of companies and firms going over to high speed grinding. It has the wheel rotating at right angles to the frame of the machine itself, and is not belt operated. These are important features, the advantages being (1) the fettler has a much better sight of his job, and (2) the machine is easier and more flexible to handle. It is accurately balanced with the weight distributed so that the fettler is able to make full use of this during grinding without exertion. The drive is supplied by a 5-h.p. totally-enclosed motor, and the starting gear is of the robust design necessary for foundry use. The main shaft is carried in two sets of double-row self-aligning ball bearings of ample size, and the

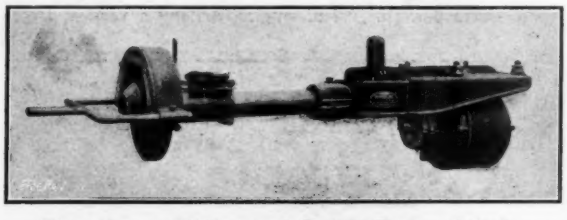


Fig. 35.—A High-speed Swing Frame Grinder.

roller chain which drives the main shaft runs in an oil bath. The motor housing, and all other castings except the oil bath chain case (which is aluminium), are in cast steel. The second addition to the Pneulec line is a Jarr rollover pattern draw type moulding machine. In addition to the foregoing there are also Pneulec Royer sand mixing machines which embody several minor improvements in the construction over those exhibited at the 1929 Fair. The main principle of operation, however, remains the same.

Donovan & Co.

On the front of this stand the firm has erected an iron-clad industrial switchboard built for the Burton Constructional

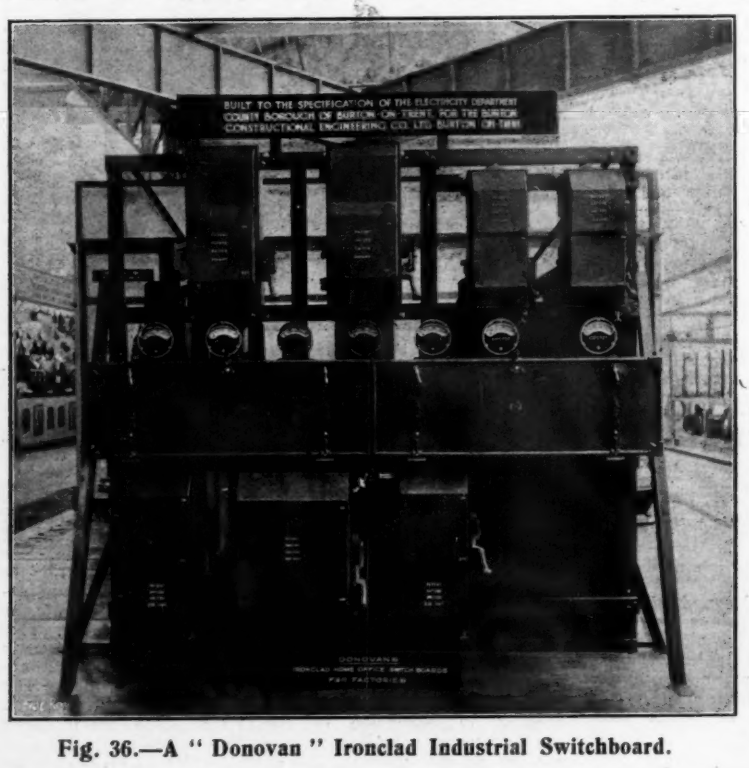

BUILT TO THE SPECIFICATION OF THE ELECTRICITY DEPARTMENT
COUNTY BOROUGH OF BURTON-ON-TRENT, FOR THE BURTON
CONSTRUCTIONAL ENGINEERING CO. LTD. BURTON-ON-TRENT

Fig. 36.—A " Donovan " Ironclad Industrial Switchboard.

Engineering Co., Ltd. The board, which is illustrated in fig. 36, has an 800-A isolating main switch in the bus-bar chamber, and it is arranged for six outgoing circuits rated at from 100 to 300 A, each with its ammeter. The contact clips of the switches are mounted in spring steel saddles, ensuring that the pressure on the contact blade is even and constant. All the gear is interlocked to prevent any accidental contact with live metal. The company shows a range of standard " Safuse " switch-fuses. Another notable exhibit is a 300-A three-phase change-over switch, and there are several examples of interlocked switch plugs, motor starters and controllers, and dimmer switches. To meet the requirements of Home Office regulations for an easy means of isolating switchgear, transformers and motors, the company has evolved two forms of link box. In the smaller form the links have floating contacts which are held tightly by steel springs. Means are provided for testing the current taken by each phase of a motor. In the larger pattern (for 130 A) the link consists of two free plates and two rods arranged to draw together. By this means the plates are expanded in the clips to make a very positive contact. Standard fuse boards of several kinds complete the exhibit.

Wardle Engineering Co., Ltd.

This company's exhibits include a representative selection of " Workslite " reflectors incorporating a patented easy-

Fig. 37.—A " Maxheat " Radiator.

wiring cap and vibration-proof lampholders. In the one piece spinning the bead is closed and the metal is free from internal strain, the enamel adhering without tendency to chip or peel. The exterior surface is a pleasing green and the reflecting surface a dense white. Gastight lanterns with cast-iron reflectors and skirted dispersive reflectors are also displayed, together with a varied selection of lanterns and fittings for works and yard lighting. During the past year many new designs have been produced, and several of the latest " Avenue " lighting units are displayed. Among them is the " Avenue " bracket No. 6961

Fig. 38.—An " Avenue " Lighting Unit.

(fig. 38), which has an 18-in. projection and is 4 ft. 4 in overall. A selection of fuse, switch and time-switch boxes together with backplates, wallplates, and porcelain vibration proof lampholders are displayed on the counters, these counters being illuminated by means of " Prismat " bulkhead fittings for industrial lighting. An effective display of the new " Maxheat " electric tubular heating system has also been arranged. " Maxheat " radiators, rated at 500 W and 750 W, are also included in this display; one of them is illustrated in fig. 37. The tubes are available in lengths of from 2 ft. to 14 ft., with loadings of 150, 200, or 250 W per ft.

Young, Osmond & Young, Ltd.

This company is exhibiting various examples of its "Unity" heating system, the construction of which is illustrated in fig. 39. It consists of a nickel chromium coil (1) laced on a mica frame (2) strengthened at its edges by U-shaped metallic beadings (3) which also serve as bus-bars to which the coil is connected. Oval shaped mica insulators (4) are fixed to the frame. This constitutes the element, which is unbreakable. The element is encased in a steel tube

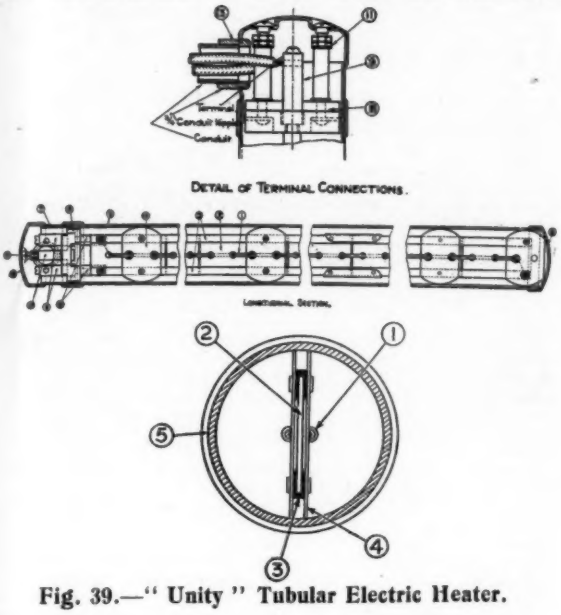


Fig. 39.—"Unity" Tubular Electric Heater.

(5) 2 in. in diameter, supplied in standard lengths with a steel cap (6). At the other end a flange (7) is fitted to the tube, forming a seat for the terminal base (8) on which are mounted heavy brass terminals (9) positively connected by brass lugs (10) to the bus-bars. A brass earthing terminal (11), electrically connected to the tube, projects through the porcelain base. A steel cover (12) is fitted over the end, forming a terminal box with side entry (13) suitable for connection to screwed conduit or flexible tube and arranged to receive brass or insulated bushes for lead-covered or flexible cables. Brackets secure the tube to the skirting board or other fixture as necessitated by local conditions. The examples shown include heaters for heating buildings, tar, crude oil, &c., traction work (available in two patterns, up to 600 V and 1,500 V) tubular 4-bar radiators for use where wall space is limited, cupboard heaters, &c.

Electrical Power Engineering Co. (Birmingham), Ltd.

A special feature of this company's exhibit is a heavy-current type motor-generator set. In view of the large demand for this type of plant for chromium, cadmium, and similar plating, the company has developed a new line of generators from 6 V, 100 amps. to 10 V, 4,500 amps., the set exhibited comprising a 30-h.p. motor direct-coupled and mounted on a bedplate to a 10-V, 2,000-ampere generator at 950 r.p.m. Fig. 40 illustrates one of these sets. Other exhibits include motor generator sets and vertical-geared double-spindle motors specially designed for "talkie" apparatus, a new line of squirrel-cage and slip-ring induction motors, and the "Warwick" lighting plant and constant potential battery charging sets.

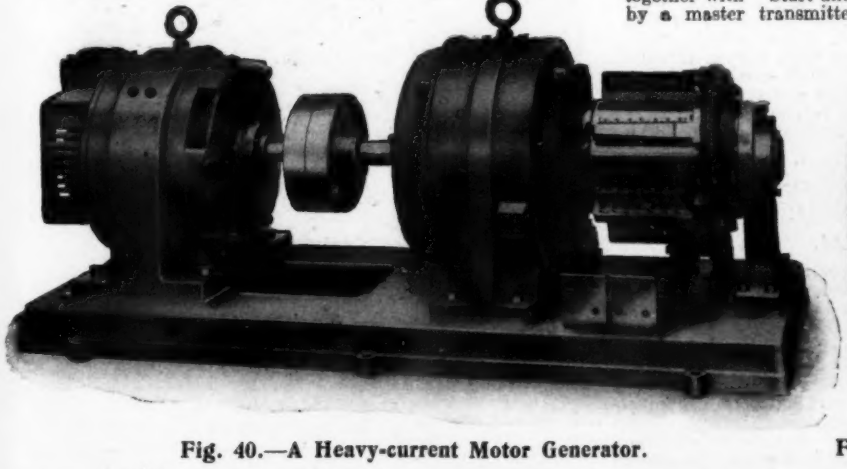


Fig. 40.—A Heavy-current Motor Generator.

Birkbys, Ltd.

A large collection of "Elo" mouldings of many kinds has been arranged by this company. There are several outstanding items, among which may be mentioned a transformer tapping switch base 16 in. in diameter, arranged to fit on a 3½-in. spindle, and with provision for 16 taps (fig. 41). Another excellent example of clean moulding is a loud speaker chassis and diaphragm; the latter is only about 1/32 of an inch in thickness. A great deal of radio apparatus is on view, including a panel with over fifty hexagon metal inserts, dials, transformer parts, cases for radio sets, &c. A further sample of clean-cut moulding is a switch base for a leading electrical manufacturer. In addition to the electrical mouldings there is a display of beautiful variegated "Elo" ware.

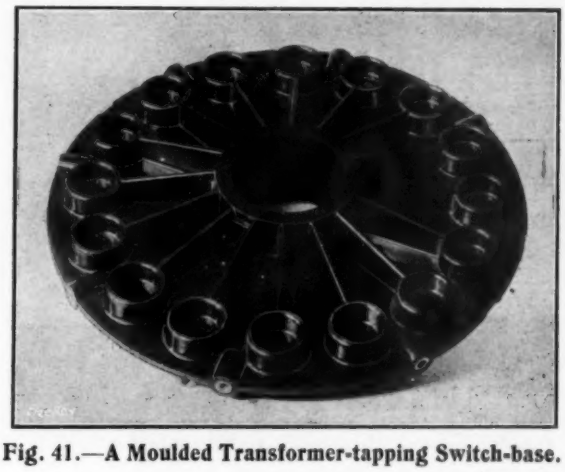


Fig. 41.—A Moulded Transformer-tapping Switch-base.

Gent & Co., Ltd.

Messrs. Gent's display, as in previous years, is of a varied character. It includes improved mining bells, and relays, suitable for working in parallel on bare wire signalling, and passed by the Home Office, improved tapper keys, mining pushes, heavy-duty power pushes, and telephones, all incombustible and flameproof. There are examples of water-level indicators and alarms for indicating and recording step by step the rise and fall of liquid level, including a new "Tangent" high and low liquid level alarm with diversion relay (fig. 42), suitable for a.c. or d.c. circuits; this cannot be left out of commission. New model float switches are also shown. The motor sirens exhibited comprise a.c. and d.c. patterns in sizes ranging from 0.1 to 4 h.p. suitable for sound signals, fire alarms, &c., and for use at mines and in other industries, as well as for coding signals. A new "Tangent" electric motor bell operated by a 0.1-h.p. motor, suitable for fixing in the open and for use at landing stages, ferries, fire stations, &c., is another exhibit. There is an interesting display of "Pul-syn-etic" electric clocks, clocks in Bakelite, cast-iron, watertight and wood cases, process-timing clocks, together with "Start and Cease" sound signals, all controlled by a master transmitter on the stand. The well-known "waiting-train" turret clock shown is capable of driving four 5-ft. dials. A similar but larger movement is driving the four 25-ft. dials at the Royal Liver Buildings, Liverpool, and the four 26-ft. clocks of the Singer Manufacturing Co., Glasgow. A motor-driven striking apparatus, controlled by a time transmitter, is in operation, counting the hours on a ¾-cwt. bell. For the rest, the exhibit includes telephone apparatus, staff locators, indicators, pneumatic bells and pushes, idle-machine and output-recording apparatus, radio apparatus, signal lamp relays, &c.

Fig. 42.—A Liquid Level Alarm.

Petters, Ltd.

This company is exhibiting a 195-b.h.p. three-cylinder "T" type atomic Diesel cold starting airless injection heavy-oil engine which is the largest size of the series yet exhibited. Petter engines of this type are made in one, two, three, and four-cylinder units in sizes from 25 to 260 b.h.p. for all industrial purposes. They meet the demand for an oil engine of medium size, possessing Diesel high thermal efficiency without the disadvantages generally associated with this type of engine. The simplicity of design is extended to the cylinder head by the complete elimination of all inlet and exhaust valves work-

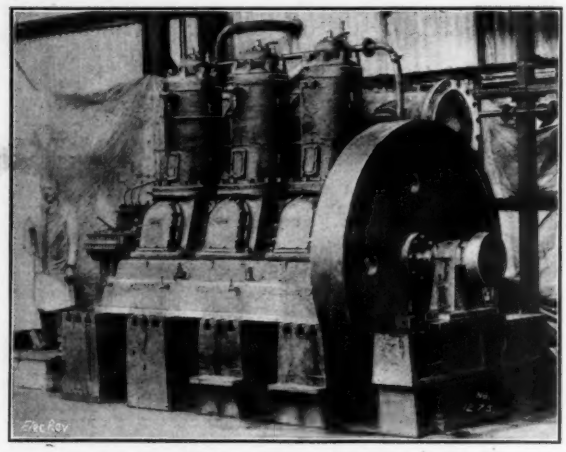


Fig. 43.—A Petter "Atomic" Diesel Engine.

ing in the combustion chamber. All valve grinding-in, and delicate valve adjustments are eliminated, together with the valve operating mechanism such as bevel or helical wheels, lay shafts, cams, rockers, &c. The fuel pump is of the simplest construction, embodying a glandless plunger, the wear being infinitesimal while leakage is noticeably absent. High thermal efficiency is attained by perfect fuel combustion in a special design of chamber. Due to the compression temperature reached, immediate ignition occurs, and combustion proceeds rapidly along the entire mass, causing a rise in pressure near the beginning of the working stroke. The whole process is developed with absence of shock. Practically all grades of fuel oils can be employed including crude, residual, or refined petroleum, tar, shale, vegetable and animal oils. With the object of avoiding mechanical complexity the company adheres to the employment of crankcase scavenging. The main bearings remain free from the effects of crankcase suction and compression, by the use of special sealing rings, and thus low lubricating oil consumption is secured. A dry crankcase is employed, the oil being drained into a receptacle for use again, after filtration. On account of the solid injection of fuel there is no necessity for the installation of a high pressure air compressor, intercooler, receiver, valves, piping and mechanically-operated oil sprayer. A centrifugal governor controls the speed by varying the amount of fuel injected into each cylinder per working stroke, any excess pumped, over that required by the load, being by-passed. A handwheel attachment enables the speed to be reduced from normal through a wide range—the governor operating at all speeds. Lubrication is of the forced feed sight feed type and supplies piston, cylinder and crankpin. The main bearings are "ring" lubricated. The engine, which is illustrated in fig. 43, is totally enclosed.

The exhibit also includes a 950-watt "Auto-Petter-light" plant, surface ignition (hot bulb) cold starting engines, and small power oil and petrol engines in sizes ranging from 1½ to 5 b.h.p.

Bull Motors, Ltd.

The principal exhibits on the stand of this company (which is associated with Agricultural & General Engineers, Ltd.), are two generators which have been built for recent orders from well-known companies. The first is a d.c. slow-speed generator, for coupling to a "Paxman" oil engine. The dynamo is rated at 120 kW, 220 V, d.c. It is compound-wound and runs at 300 r.p.m. The other generator is a vertical spindle dynamo, for coupling to a water turbine in connection with a water power scheme in Ireland. It is compound wound and runs at 200 r.p.m. The output is 52 kW, 220/260 V. It is fitted with a specially heavy spherical seated ball thrust suspension bearing at the top, and is capable of operating under a continuous load of 4½ tons. This generator is of interest, as machines of a similar type can be used as vertical motors for pumping installations. Two arc welding plants are also shown. One of these machines—the Bull "Midget"—is a 100-A portable plant consisting of a d.c. motor driving a d.c. welding dynamo with standard control gear comprising starter, shunt and series field regulators, instruments, and reactance mounted in a sheet steel cubicle above the machines. A noticeable feature is the compact design which enables all control gear to be enclosed in the sheet steel cubicle and renders the set easily portable. A 200-ampere arc welding plant of the stationary type, is exhibited, which is complete with 200-V driving motor, starter, shunt and series field regulators for dynamo, instruments, &c. In addition to the above exhibits, the company is displaying a number of its small standard a.c. machines.

P. Webber, Ltd.

This company has a varied display of electric lighting fittings in silk and imitation mother-of-pearl. It includes floor and table standards, bowls, &c.

S. O. Bowker, Ltd.

The feature of this exhibit is the "Tenby" wiring system and junction boxes for lead covered cable. Bakelite universal boxes for c.t.s. cables and "Tenby" tinned brass saddles, buckle clips and brass saddles, lead alloy saddles, copper and brass earth clips, copper earth strip and "Tenby" bonding bars and clamps are also shown. In addition there are the "Allday" car cigarette and cigar lighter, and desk cigarette and cigar lighter.

Ringsdorff Carbons (England), Ltd.

A comprehensive exhibit of carbon brushes of all types and sizes forms the bulk of this exhibit—the range rising from a small fan-motor brush to one for the largest turbo-generator. There is an interesting display of the smaller sizes, and a board on the stand wall bore brushes in progressive stages of manufacture—from the raw material to the finished article, complete with connections. The method of fitting the connections is of interest, especially as it eliminates holes in the carbon. Shallow slots are cut in the top of the brush (both sides), and into these the flattened ends of the connectors are placed, being held in position by a copper collar. The whole is then effectively clamped by a steel clip fitted under hydraulic pressure. The result is a very solid connection. There are two or three brushes which have been in service in power stations for long periods and show remarkably little wear. In addition to brushes, the company exhibits all types and grades of rods, tubes, and lightning arrestors, as well as rings for pump glands, &c.

J. B. Stone & Co., Ltd.

The feature of this company's exhibit is its nibbling machines. The standard types, all of which are of improved design, are shown in operation, cutting sheet metal from ¼ in. to 5/16 in. thick. The smallest size machine (fig. 44) is intended primarily as a bench machine for use when cutting thin stock

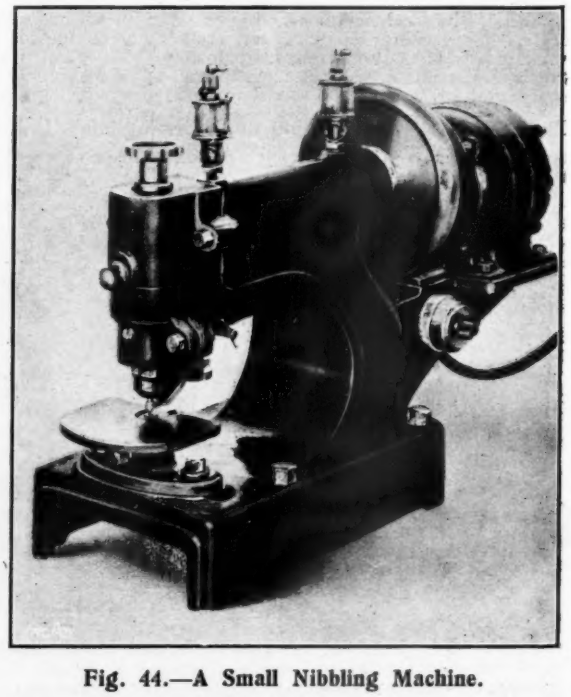


Fig. 44.—A Small Nibbling Machine.

up to 14 gauge. The punch and the die are the same as in the larger machines. The machine is specially adapted to small work such as trimming embossed work, duplicating small parts, template making, small stencil or sign cutting, &c., and is geared directly to a motor which is furnished complete with the machine. The larger machines can also be supplied with direct-geared motors if required, thus making a complete unit.

Exhibits at Olympia, London.

After being held at the White City from 1921 to 1929, the London section of the Fair is this year located at Olympia, the display not only occupying the ground floor and gallery of the Main Hall and its annexe and the Small Hall, but also two large floors of the huge extension to Olympia at present in course of completion. As usual, the exhibits in the London section are confined to the lighter trades, they being divided into nineteen groups. There is, apart from the radio apparatus exhibits, which are compactly arranged in Group D, no definite electrical section, so that the electrical trader has to make a tour of the whole of the halls and galleries if he desires to inspect all the exhibits of interest to him. Altogether there are about six miles of stand frontage; the space occupied is, however, slightly less than that at the White City last year, it being stated by the Fair authorities that this is largely due to the fact that it was not possible on this occasion to allot to exhibitors all the space applied for. Next year an addition of another 100,000 square feet of space will, however, be available.

Although, as mentioned above, the London section of the Fair is not particularly strong from the electrical point of view, it may be described as an electrical triumph, the temporary lighting and power load on the local supply undertaking being the largest so far recorded. The General Post Office, which has a stand demonstrating the working of automatic telephone exchanges, has also installed, in addition to numerous call boxes scattered about the buildings, over 400 special telephones on exhibitors' stands.

Notes on some of the exhibits follow:—

Accurate Recording Instrument Co., Ltd.

This firm specialises in recording and indicating thermometers and pyrometers, some very interesting examples of which are shown. Although the majority of them work on the vapour-tension principle, there are also displayed some thermo-electric instruments, as well as sparking plugs for motor vehicles.

Bakelite, Ltd.

Specimens of moulded electrical fittings made from the various forms of bakelite are to be seen on this stand, where also some useful literature is available, giving information about the physical properties of the material, its dielectric strength, for example, being given as from 250 to 700 V per mil. Attention is also again being drawn to the flaked fabric moulding material by means of which, owing to the introduction of small flakes of fabric, mouldings with a higher shock resistance than ordinary bakelite can be produced. Other exhibits include "Damarda" lacquer for colouring electric lamp bulbs either by dipping or spraying, and bakelite lacquer, cement and varnish, the last being intended for the insulation of coils, windings, &c.

Beetle Products Co., Ltd.; British Cyanide Co., Ltd.

These two concerns have a joint stand on which are shown many specimens of mouldings made from synthetic resin powders known by the names "Beatl" and "Roanoid." Among the examples of finished articles shown are switch covers and brackets for both house and ship use, electric table lamps, &c.

British Celanese, Ltd.

"Cellastine," a cellulose-acetate moulding composition for producing insulating mouldings of all kinds down to a thickness of 20/1,000ths of an inch, is to be seen on this stand, together with specimen mouldings in a variety of colours, and also examples of moulded rods and sheets. "Celastoid" is another product of the company for insulation and other purposes, it being available in both transparent and opaque colours and in sheets and tubes.

Cambridge Instrument Co., Ltd.

Some highly-developed scientific electrical instruments are to be seen at this stand, including mains testing sets, thermo-electric indicators, galvanometers, and the "Dolazalek" electric meter. The firm is also exhibiting at the Birmingham section of the Fair, a lengthy reference to the stand having been published in our last issue.

I. Calvete, Ltd.

This firm again occupies a large stand, and has a complete display of electro-medical appliances, including "Everay" high-frequency violet-ray sets and "Solart" ultra-violet and "Icalite" radiant-heat lamps, which are made in a variety of sizes, ranging from a small portable appliance to hospital sets. Other specialities on view include electric hair dryers, clippers, curling-iron heating stoves for hair-dressing establishments, "Thermical" diathermy apparatus, ozonisers, and massage appliances. Something of a novelty, intended for advertising purposes, is a penny-in-the-slot h.f. treatment machine.

Burovox, Ltd.

Loud-speaking telephones for use in offices, works, ships, mines, and noisy engine rooms are again displayed by this concern. The marine patterns include both portable and bridge pedestal types in which the loud-speaker and microphone are housed in non-corrosive, waterproof, aluminium hoods. A new introduction is a loud-speaker to enable couriers on sight-seeing motor coaches to address the passengers while travelling.

Darwins, Ltd.

This well-known Sheffield firm specialises in the production of cobalt-steel permanent magnets, and on its stand has a most interesting display not only of magnets themselves in a variety of shapes and sizes, but also of a range of finished instruments made by different manufacturers in which the magnets are employed. They include cone loud-speakers, telephone earpieces, magnetic cut-outs, galvanometers and ammeters.

Thomas J. Digby Illuminating Engineering Co., Ltd.

Specialists in shop-window and other display lighting, this firm exhibits a variety of patterns of flood lanterns, trough lights, and projectors. Electric moving signs and sign letters are also shown, while there is an ingenious electrically-operated device, comprising a small motor and 500-watt focusing lamp, for producing changing colour effects in shop windows.

Ever-Ready Co. (Great Britain), Ltd.

Dry batteries in a variety of sizes and shapes are displayed by this company for pocket torches and lamps, as also for radio and other purposes. Specimens of the firm's accumulators are also on view, together with examples of portable electric lamps and other electrical accessories.

The "Indurite" Agency.

This is another concern specialising in the production and supply of a non-inflammable moulding powder known as "Indurite," and a range of insulating mouldings made therefrom for a variety of purposes, including radio and general electrical work, are shown. The material is stated to have great dielectric and mechanical strengths, and an electrical resistance of from 50 to 80 million megohms per cub. centimetre. It is claimed that the material leaves the mould with a smooth glossy finish, obviating any subsequent machining, and that it can be readily drilled and tapped.

K.F.M. Engineering Co., Ltd.

Among the specialities of this firm are tubular lamps and reflectors for the lighting of shop windows, showcases, pictures, &c. The tubular lamps, which are made in various sizes and capacities, are held between end blocks which obviate the use of flexible conductors between the ends of the lamp. Illuminated box signs and letters, as well as a variety of daylight signs are also displayed.

Marco Refrigerators (1929), Ltd.

An excellent display of British-made "Marco" refrigerators is made by this concern for the conservation of food and ice-making. The refrigerators are made in sizes ranging from 4½ cu. ft. for domestic use, up to 1,100 cu. ft. for hotels, clubs, hospitals, ships, &c. The low-temperature is provided by a compact installation of air-cooled compressor driven by a small electric motor and a cooling unit comprising a brine tank with expansion coils. The latest addition to the company's productions is a combined all-metal food-storage refrigerator and kitchen table.

Thermega, Ltd.

This firm again shows its well-known electrically-heated pads for human body local application, and also bed blankets. The pads, which will maintain a constant heat of 120 deg. F., and the blankets, are suitable for use on any voltage between 100 and 250 V; they are supplied for either a single temperature or with a three-heat switch. The blankets are also now being fitted with a special plug contact, so that, when sufficiently warm, the user can switch off the electricity supply without removing the hands from under the bed clothes. At this stand is also to be seen the "Xtra-Point" lamp holder lately put on the market by W. E. Beardsall & Co., Ltd., and described in our issue of December 27th, 1929, p. 1165.

Synchronome Co., Ltd.

This concern is again present with a range of electro-magnetically operated clocks. The current for the working of the instruments is supplied from dry cells, an electric bell being incorporated in the circuit in such a way that it comes into action when the cells tend to become exhausted, so giving a warning that replacement is necessary.

The Future of the Australian Market.

The Views of Mr. R. W. Dalton, H.M. Senior Trade Commissioner.

(*Concluded from page 370.*)

Imports of Machinery.

The total imports in this class in 1927-28 were valued at £16,209,045 as compared with £16,640,186 in the previous year. In 1928-29 the value fell to £14,566,740, largely owing to heavy decreases in imports of cables, dynamo-electric machines, telegraph and telephone appliances, motive power machinery and sewing machines. The growth of this trade since pre-war years is an illustration not only of the large increase in the general absorptive capacity of the country but also of the effect of the development of local industries in diverting trade from goods themselves to machines and machinery for the manufacture of goods. The trade in 1913 amounted in value to £4,841,000, of which the United Kingdom secured £2,547,000, or 52.6 per cent., and the United States £1,435,000, or 29.6 per cent. By 1927-28 the trade had increased to a value of £16,209,045, of which the United Kingdom secured £8,708,938, or 53.7 per cent., and the United States £5,418,147, or 33.3 per cent.

On the surface, therefore, it would appear that the position has continued fairly satisfactory from a British point of view, for not only has the turnover of the trade increased enormously but the British percentage has remained fairly constant. Moreover, the advantages which the United States secured during the war do not seem to have made a very great difference in her ultimate percentage of the total post-war trade. On closer examination of the details of trade in individual items, however, there do appear certain unsatisfactory features. Details have been taken out of the statistics of goods in which there is severe competition from foreign countries. The total trade in such goods amounts to £9,614,384 out of the total trade in the class of £16,209,045 in 1927-28; of this trade the United Kingdom secured a total of £3,432,402 or about 35.8 per cent., while of the remainder of the trade in the whole class (£6,594,661) she secured no less than 80 per cent. It is significant, too, that out of the trades in this class in which there is severe competition (*i.e.*, £9,614,384) the United States secured trade to a value of £4,578,371. Thus in that part of the trade in this class in which there is severe competition (which is about 59 per cent. of the total imports in the class) the United States secured more than a million pounds' worth of trade more than the United Kingdom, and no less than 47.7 per cent. of the total; of the remainder of the trade in the class (*i.e.*, £6,594,661) the United States secured only £839,777, or less than 13 per cent. The further interesting fact appears that out of the trade in this class in which there is severe competition (*viz.*, £9,614,384) the United Kingdom and the United States together secured £8,010,773, or nearly 84 per cent., while of the trade in which there is not the same severity of competition with the United Kingdom (*viz.*, £6,594,661) these two countries together secured £6,116,313, or nearly 93 per cent. Two things become obvious, therefore: that the competition which is to be feared in this class comes almost entirely from the United States, and that though the severity of that competition is felt in a restricted number of items, it is extremely successful in those items to the extent even of surpassing in its total results the results secured in the same items by the United Kingdom.

Sales of Radio Apparatus.

The Trade Commissioner reviews the history of the progress of wireless broadcasting in the Commonwealth, and adds that among developments of importance is the definite introduction of the a.c. all-electric set for popular use, accompanied by the manufacture of radio apparatus and parts by local workships. It is anticipated that before long, at least in the capital cities where suitable current is available, battery sets for private use, except of course portable sets, will be practically eliminated.

Many of the large Australian radio manufacturers are in close association with overseas manufacturers, and are kept fully informed of the latest developments, which are incorporated in their apparatus. The local production of parts has also improved considerably, and in many instances locally-assembled sets contain only locally-made parts. For the last few years, also, the tendency has been for users to purchase factory-made sets rather than construct their own receivers. Instalment purchasing systems have helped the sale of complete sets as against parts for home construction. Sales of British radio apparatus have been largely restricted to valves, loud-speakers, and small quantities of well-known essential radio parts. In the supply of valves there is keen competition from the United States and Holland. British makers have not catered for the Australian market in made-up sets, but one firm recently introduced a kit for a 3-valve receiver which was well supported by advertising. Notwithstanding that it was designed to run off batteries it attracted attention. Generally speaking, however, British sets are unknown in the market. In spite of this, the United Kingdom has obtained a considerable share of the trade in parts, speakers and parts for assembly. Nevertheless, in Mr. Dalton's opinion, there is still a good deal of ground to be made up before British trade in this class of goods can be said to be satisfactory.

Methods of Approach.

In dealing with the subject of the method of approach to the Australian market, Mr. Dalton surveys at some length the different ways in which trading systems have grown up in the Commonwealth and have been modified or evolved. Much of this survey relates to smaller lines of general trade than those with which the electrical exporter concerns himself. But it is interesting to read that in the Trade Commissioner's opinion the day of the merchant, as merchant, in Australian trade has almost gone, although this does not mean that the Australian trade in London has disappeared. For importers in a market so far away it is urgently necessary that there should exist for them in their main markets of supply an organisation which can look after their interests *vis-a-vis* the manufacturer and supplier. Thus there has grown up a new type of Australian trade in London with marked differences from the old system. A considerable number of the constituent parts of so-called "London shipping in the Australian trade" are not buying for themselves at all but for principals in Australia for whom they act merely as agents, or in some cases employés. Numbers of them have no buying powers at all, or very limited powers; they buy on definite instructions from somebody in Australia who knows what he wants and is determined to have it. In short, the London buyer is becoming more and more a paid servant of his master in Australia who issues to him categorical instructions as to goods to be purchased. There are many sections of this new type of buying organisation. Even heavy machinery and plant and materials for large contracts are often so handled in some way or another.

It is well known that Great Britain's share of the total import trade of Australia has been gradually declining during the last few years. The Trade Commissioner ascribes this decline partly to the development by the Commonwealth of secondary industries in lines of trade which in the past best lent themselves to what may be called automatic systems of trading or repeat order business, and partly to the fact that in their endeavour to secure trade, our foreign competitors, not having the advantage of a trade like London shipping, have been forced to display in Australia itself the kind of activity which is becoming more and more necessary every year, that is, they have been forced to go to Australia to display their samples and services to the man who is the real buyer.

It is of some importance to the exporters of the smaller electrical lines to learn that the decline in the significance of the wholesale trade and the rise of the department store have in themselves made more difficult any system of automatic trade with the Commonwealth. The system now is for each individual department buyer to demand to see on the spot in his store samples and patterns of goods which he is expected to buy. If he does not, in nine cases out of ten, he will refuse to buy.

It is gratifying to read that the last few years since the war have seen a great development in visits to Australia by heads of firms in order to ascertain for themselves on the spot how business was being done and through what channels the main demand was being satisfied. As a result of these visits radical changes have been made in the selling practice of many firms and in almost all cases improvement in their total turnover has been shown.

Local Manufacturing Industries.

The report points out that the success of Australian industries has been largely in the simpler or "bread-and-butter" lines of manufacture, and these are just the lines in which British trade formerly was most successful. On the other hand, foreign trade has been most successful in specialities and these are the lines which British firms will have to supply in increasing quantities if we are to maintain our position on the market. Incidentally, too, these are just the lines which require more specialised selling on the spot in Australia itself and cannot be sold adequately through London only.

The Trade Commissioner's report contains another piece of evidence of the intention of Australia to proceed as rapidly as possible with the study of questions which are likely to

develop the progress of industries on the best economic basis. It records that arrangements have been made for the amalgamation of the Australian Commonwealth Engineering Standards Association, which has been functioning for some years, and the Australian Commonwealth Association for Simplified Practice in a new entity to be known as the Standards Association of Australia. Divisional committees and sub-sections will be set up as may be necessary, and the closest contact will be maintained with similar bodies in other countries, and especially those in the United Kingdom.

Electrical Development Board.

The Commonwealth Government has been giving close attention to the formulation of a national plan for the development of the power resources of the country and has obtained the advice of an eminent authority on power problems. Mr. Dalton states that this authority has recommended that where provision has not yet been made for such an instrumentality, each State should forthwith constitute an authoritative body, such as a power commission, or a power board, to control electric power development within the State, and to co-ordinate and direct the supply and distribution of power generated by existing authorities. Such a body should also make recommendations with regard to the development of power sites initiated by the Government and private undertakings, determine zones of distribution, and arrange for the inter-connection of generating stations and transmission systems. Other duties of the power board would include the issue of licences to suppliers and distributors of power, the determination of methods and maximum rates of charging for the supply of electrical energy within any zone, to advise the Government with regard to financial assistance for the purchase in bulk and the local distribution of electrical energy by co-operative societies formed in rural communities, and to encourage the formation of such societies to advertise the advantage of electrical utilities, and to prepare for the Commonwealth authorities full statements of projects over which the Commonwealth would have full jurisdiction.

Another recommendation is that the Commonwealth should appoint an electricity commission to consist eventually of three persons, but consisting at first of an engineer assisted by the chairman of the State Electricity Power Commission or Boards. It is recommended that the Commonwealth Government should control national waterways, the development of which for transport, irrigation or power by any one State might prejudice the utilisation of the resources by any other State, that the Commonwealth should assume control of electrical energy, however generated, where such energy is transferred from one State to another, and that it should assist the States in every possible way regarding the development of their power resources. When this subject was being considered by the Conference of Premiers, Mr. Alex. J. Gibson, consulting engineer, of Sydney, suggested that steps should be taken to ensure the standardisation and co-ordination of frequency, voltage, and method throughout Australia. The scheme as a general principal was approved by the Conference, and the State Premiers undertook to give full consideration to the question of the creation of such an authority.

The Australian Association of British Manufacturers, whose activities are familiar to readers of this journal, has, the Trade Commissioner states, continued to do most valuable work in the interests of British trade in the Commonwealth. It consists of representatives of British manufacturing concerns, but it also has as members manufacturers in Great Britain. It has branches in all the State capitals (with the exception of Hobart), is in close touch with both Federal and State Governments and is accepted by Governments, public authorities and the general public as the body representative of British manufacturing interests. In the past the responsibility for finding funds to carry on its work has been left very largely to the representatives in Australia of British manufacturers, and the support received from Great Britain itself has been meagre. During the past year or two, however, it has been found possible to interest the Federation of British Industries and some trade associations in Great Britain in the work of the Association in Australia. By this means the financial difficulties of the Association have been lessened, but, having in mind the value of the work of the Association on behalf of British trade, the financial support given to it from trade interests in the United Kingdom is still very inadequate.

Electric Heating.

Extracts from a paper read at the Electrical Development Association Conference at the British Industries Fair, Castle Bromwich, Birmingham.

By R. ALAN S. THWAITES, M.Inst.C.E., M.I.E.E.

THE potential heating load in this country is estimated to be of the order of ten times the total load of all kinds which is at present connected to public electricity supply systems.

The price for certain applications must be very low, and it is as well to consider how low the supply industry can justify offering, and to what extent [illegible] restrictions as to use can be made to assist in this respect. The price provisionally quoted by the Central Electricity Board to supply undertakers for supplies of the order of 10,000 kW and upwards—commonly known as the "grid price"—averages about £3 per kVA per annum, plus 0.2d. per kWh, which, as all supply authorities in Great Britain will purchase their current either directly or indirectly from the Board, is convenient to take as a basis of calculations. If we consider first entirely "off peak" load, the current costs the supply authority 0.2d. per unit, and in order to include a contribution towards the expense of distribution and management (which in the grid price are included in the standing charge), together with a profit, the usual figure offered to-day for large "off peak" supplies is from 0.3d. to 0.35d. per unit. Where, on the other hand, the heating load is not restricted as to times of use, then this load must bear a due proportion of the standing charges both on generation and distribution. On the other hand, diversity comes to our aid, with the result that the load factor of a group of heating supplies may be high, although the load factor of individual supplies may be comparatively poor. It must not be overlooked, however, that as the individual load factors improve, so the diversity diminishes, and at 100 per cent. load factor there can be no diversity.

In order to sell current for heating purposes cheaply, we must so arrange matters that the result is to improve the load curve of the system. Suppose we were able to obtain a 100 per cent. system load factor, first there would be more "off peak" kWh available until additional load for other purposes had been obtained, and, secondly, the consumers for lighting and motive power purposes would expect to share in the benefit resulting from the low cost of generation thus brought about.

At Berne, in Switzerland, the load factor is already about 90 per cent., due to the growth of heating load, with the result that the time of the "peak" now tends to move about. It is accordingly the duty of certain officials periodically to alter the time switches controlling various heating supplies so as to keep the "peak" under control.

Certain supply undertakings are inclined to the belief that if they obtain something a little more than their coal cost for current for heating purposes, they are doing quite well, but it is necessary to have regard to the other considerations.

In the case of fourteen large electricity supply undertakings in America taken together, the heating load has increased in four years by 104 per cent. For the year 1928 the heating load represented some 6 per cent. of the total load, whereas in 1924 it was 3 per cent. It is therefore still a relatively small, but rapidly growing proportion. In the case of one supply company, however, the kWh sold for industrial heating processes in 1928 had reached 21 per cent. of the total load. It is estimated that in 1929 some 6,000 million kWh were sold in the United States for industrial heating purposes.

These figures show what has been achieved in one country, and, as this is only a fraction of the load which can be obtained, it seems quite clear that the sales organisations of supply undertakings in this country can with advantage devote considerable attention to obtaining this class of load, particularly in industrial areas.

A mere comparison of heating sources on a thermal basis means nothing without a complete investigation of the total costs. In many heating processes the heat applied to the intended purpose is small, compared with the total heat supplied. Sufficient heat must be applied, not only to heat the crucible and its contents, but to raise the temperature of the muffle furnace, and also to make up for the heat losses while maintaining the temperature. The use of electricity for heating enables furnaces to be so designed as to result in a high efficiency of utilisation, and is particularly advantageous where intermittent heat is required. Its indirect advantages are: automatic control; reducing labour in operating; a higher grade product; fewer spoilt articles; no fuel handling, ash-handling, chimneys, flues, or fuel bunkers; more comfortable working conditions.

The heating of large buildings by means of a system of thermal storage appears to be quite practicable with current at approximately 0.35d. per kWh for "off peak" use. There seems to be considerable scope for reducing the heat losses from buildings by taking special precautions in their design and construction.

We now come to the question of hot water supply, the greatest immediate application of which is possibly in the home. Recent tests have been published by the Detroit Edison Company. The load curves of 1,000 electric water heaters have been aggregated, so as to obtain the effect on the power station of such a load. Fig. 3 shows the average annual consumption of different appliances in the home, from which it will be seen that the use to be expected from water heating averages approximately double that taken by an electric cooker. For a moderate size house sufficient hot water will be available if the number of gallons of water in the water heater, multiplied by the maximum rating in kW, is approximately 60. Thus, if a 2-kW heater is used, the tank should hold 30 gallons; if a 3-kW heater, 20 gallons, and so on. The question of the ratio of gallons to kW is referred to later.

The average maximum load produced by the 1,000 water heaters is 750 kW, or ¾ kW per heater (fig. 4), but on wash day the maximum load was just over 1,300 kW, or 1.3 kW per heater. This peak occurs during the morning.

Fig. 5 shows how the average figure of 2,825 units per annum is made up month by month.

The heaters tested were mostly so interconnected with the coke furnaces on the various premises that a certain amount of heat in the winter-time was obtained from that source; this explains the higher consumption during the summer than in the winter, which tends to level out the annual load curve.

Fig. 1 shows the load curve produced by 1,000 water heaters in which the ratio of gallons to kW was 4. Average conditions would probably be something like 16 gallons and 4 kW. The peaky nature of the load curve is very marked, but even so, the combined load factor for the heaters is 49 per cent.

Fig. 2 shows a similar curve for 1,000 low-capacity heaters, probably on the average about 1¼ kW and 40 gallons. Here the load curve is far more smooth, and the combined load factor is as high as 73 per cent. It should be noted, however, that the load between 4 and 6 p.m. (which for most undertakings is the time of "peak" load), is nearly double that taken during the same period by highly-rated water heaters.

The reason is that with the highly rated water heaters the hot water used for washing up after lunch is made up fairly rapidly, whereas with the low capacity heaters this is not so. The use of electricity for water heating is rapidly growing, mainly because it is so very convenient, especially in the summer time, but we can certainly sell far more current for this purpose by adopting suitable methods, and an important consideration is that this is a class for which a fairly good price is obtainable. As Mr. C. H. Smith stated at a recent E.D.A. Conference, "at a 1d. per kWh there is some hope, at three-farthings there is a lot of hope, and at a halfpenny it is easy."

The question of water heating has become so important that a special subcommittee of E.D.A. has been formed within the last few weeks to deal with this matter.

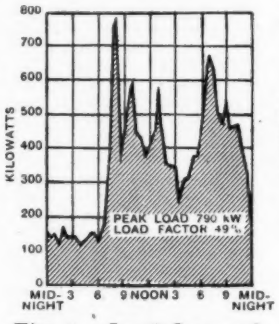


Fig. 1.—Load Curve of High-wattage Heaters.

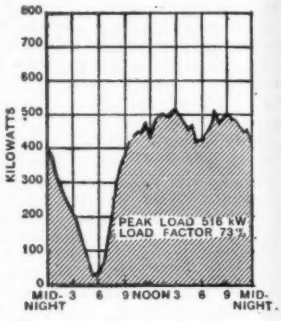


Fig. 2.—Load Curve of Low-wattage Heaters.

Discussion.

Mr. W. Y. ANDERSON (Birmingham) said that the Birmingham undertaking sold e.h.p. energy at 0.5d. per unit for electric furnaces, with the result that about 8,000 kW was connected. As that was primarily a day and night load, its value could be appreciated. They also supplied under the scheme current at 0.5d. for heating factories, where there was also a good field for development. Regarding the heating of premises on the thermal-storage principle, current could be taken during the night at an even cheaper rate. More recently they had introduced a special domestic water-heating rate of 0.5d. per unit. That had been most successful. Their total domestic heating and cooking load had grown from 16,060 kW to 40,870 kW in the last three years.

Mr. NESBITT (Leeds) stated that in that city the use of electric cookers was growing rapidly. They first managed to persuade the electrical engineers to use the cookers themselves. They were now tackling the question of electric water heating. Too much attention had been given to low-loaded appliances taking current over a long period, but there was much to be said in favour of heavily loaded appliances. On the score of economy, the automatic type of heater, heavily lagged, compared most favourably with other forms of heating. The use of apparatus for water heating in offices, factories, doctors' establishments, and so forth, was strongly to be commended.

Mr. E. J. JENNINGS (Birmingham) said it was of the first importance that, before they tried to sell these services, they should themselves adopt them. In Birmingham they gave preferential terms to the staff of the department in order that they should introduce electrical appliances into their homes, and by this means the department had acquired valuable data. A strong case could be made out for the all-electric home, when current could be obtained at ½d. per kWh.

Mr. WELLS (Y.E.P. Company) urged upon the Association the need for collecting information about experiences and costs of electrical heating, &c., particularly on the domestic side, in the various districts, because unless they knew something about the potential market they could not organise to get business.

Mr. ADAM (Seaham Harbour, Sunderland) expressed the opinion that effective development must largely depend upon a low price of current. There were great possibilities where the price was in the neighbourhood of ½d. per kWh, but where double that figure had to be paid it was not easy to make progress.

Mr. J. COXON (Post Office) agreed that the essence of the question was that of price per kWh. Regarding the question of loss in the circulation system with immersion heaters, he said there were great advantages in the tank being at the point at which the water was required.

Mr. C. M. SHAW (Worcester) said he had not experienced scaling trouble in immersion heaters. The best method was to install the heater where the water was wanted, and it might be necessary to have one heater in the bathroom and one in the kitchen. A difficulty often arose because engineers were not allowed to put in a pressure tank. He advocated the standardisation of plugs and other component parts, which should be purchasable at the village store. One or two standard types of water heaters, produced on mass lines, should be obtainable at a low price.

Mr. T. A. G. MARGARY (Wolverhampton) contended that the only hope of reducing the price to the consumer was by increasing the load factor, and water storage was the hope of the distributing authorities, as it would provide a night load.

Mr. SYMONDSON (Young, Osborne and Young) said in some areas where the price was high he should hesitate on the score of economy to advocate the thermal-storage system. In certain types of building he was inclined to favour a combination of thermal storage and direct heating.

Mr. A. G. LOBLEY (Birmingham) submitted that a very strong case could be made out in respect of reliability and economy for electric furnaces for the heat treatment of metals. In many operations, such as annealing and carburising, the electric furnace came out cheaper than the gas furnace. The electric furnace had a big pull over other power furnaces, in that it was quite easy to ensure uniformity of temperature in the furnace, which was most important in carburising operations.

Mr. H. H. BERRY said in places where the cost of current was high a central heating system with coke, supplemented by electric heating, might be used advantageously.

The CHAIRMAN (Lieut.-Col. W. A. Vignoles) pointed out that in a very large number of areas, and especially in those in which there was the greatest population, the cost per unit worked out at a penny or less for purposes other than lighting.

Mr. R. A. S. THWAITES replied to some of the points raised.

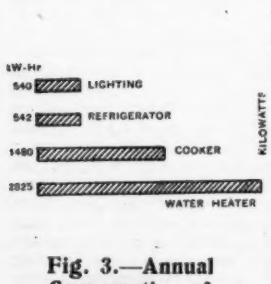


Fig. 3.—Annual Consumption of Appliances.

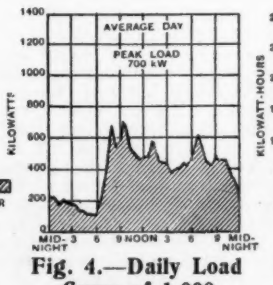


Fig. 4.—Daily Load Curve of 1,000 Water-heaters.

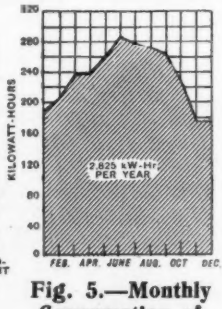


Fig. 5.—Monthly Consumption of Water-heaters (reinforced by fuel in winter).

Mercury-arc Rectifiers.

A brief general review of the sphere of application of the high-power steel-tank type apparatus.

BY J. C. READ, M.Sc., A.M.I.E.E.

(Extracts from a paper read before the RUGBY ENGINEERING SOCIETY).

DURING the last few years striking technical progress has changed the high-power rectifier* from a rather unsatisfactory device to one which will, without doubt, find a useful place in high-voltage d.c. railway-electrification work. Mainly as a result of increased knowledge of the mechanism of the arc, progress has been made in two directions: first, arc-backs have at last become sufficiently rare for satisfactory commercial service to be regularly obtained; secondly, there has been most striking development of the rating that can be obtained from a given size of rectifier, the limits both of current and of voltage obtainable in a single unit being now well above anything at present likely to be required in the industry. Within its particular sphere of application, the rectifier has now "arrived."

The losses, cost, and size of a rectifier (as distinct from its transformer) are all functions of current rather than of kilowatts, being affected by voltage to only a minor degree. Hence, its field of application is at high voltages, roughly as follows:—

(*a*) For ordinary power and lighting service at 500 volts and below, only commercially justifiable in very rare cases, and not at all at the lower voltages.†

(*b*) For traction at 600 volts, higher cost, larger floor space, and 1½ to 2 per cent. lower efficiency than rotating machinery; it is therefore generally only justifiable in special cases in which rotaries are unsuitable on account of noise, ventilation difficulties, intended frequency change, or very low load-factor.

(*c*) At 1,500 volts, compared with two 750-volt rotaries in series, about equal in cost, or slightly lower; requires less floor space, and has 1½ to 2 per cent. higher efficiency; however, owing to its inherent disadvantages of lower power factor and impossibility of regeneration, the two classes of apparatus will probably exist side by side at this voltage.

(*d*) At 3,000 volts and above, will probably displace rotating machinery almost entirely, as soon as a little more experience has been gained with it; it has heavy advantages in cost, efficiency, and floor space, sufficient to offset the loss of the ability to use regenerative braking; at that voltage it may even go far to settle the rivalry between the d.c. and a.c. systems of railway electrification, in favour of the former.

A few interesting cases in which rectifiers are installed, or on order, are:—

Berlin Suburban Railways.—Completely electrified in 1926/8 at 800 volts, principally with rectifiers, of which 119 are in use, of various makes.

Czecho-Slovakian State Railways.—A 1,500-volt, 4,270-kW, rectifier in use.

Consolidated Mining Smelting Co.—A 650-volt, 6,500-kW, rectifier is being installed.

Delaware, Lackawanna and Western Railroad.—The entire supply will be given by means of eighteen 3,000-volt rectifiers, totalling 37,000 kW.

The rectifier involves greater total complication than rotating machinery, but its characteristics are sufficiently advantageous, mainly at high d.c. voltages, to justify its use within its own proper field of application. The rating of any given size of rectifier is fixed rather by the current to be carried than by the kilowatts, and thus the size and cost per kW decrease rapidly at high d.c. voltages. Actually the arc-back limit depends both on voltage and on current: hence at the higher voltages rectifiers are rated down somewhat. As regards sustained overload capacity, the heat storage capacity of the anodes is much smaller than that of the stator and rotor of a rotating machine, so that the heavy overloads normally called for in railway service are obtained, as far as the rectifier portion of the equipment is concerned, by putting in a rectifier of increased continuous rating. Momentary overloads and short-circuits are somewhat more easily carried by rectifiers than by rotary convertors.

Most of the loss is in the arc-drop, which varies only slightly with current, and is independent of voltage. Consequently, the efficiency is nearly constant over a wide range of load, and improves considerably with increasing d.c. voltage. In railway service the load is usually very fluctuating, and the load factor is therefore low, which gives the high light-load efficiency of the rectifier some importance. The difference between the all-day efficiencies of the rectifier and the rotating machine is equal to the difference between what their actual efficiencies would be at a load slightly less than (full-load)×(per cent load factor/100). Thus in the case of 600-volt units the rectifier will give a better all-day efficiency on any load factor lower than about 40 per cent. Load-factors of 20 to 25 per cent. are not uncommon, especially on the Continent, and in such cases 600-volt rectifiers are showing improved all-day efficiencies; but it must be said that in most of these cases the converting plant is grossly too large for the load, and that when proper advantage is taken of the overload capacity of rotaries load-factors below 30 to 35 per cent. are rare.

No reliable data on the maintenance cost of rectifiers are yet available, as the production of reasonably reliable machines only dates back a year or two. Indications are, however, that the maintenance cost will be on the average about the same as that of good rotary convertors, as the cost of brush-renewal is about equalled by the cost of cooling water.

Specially trained men must be available for any large overhauls.

Considering the initial cost of the complete electrical equipment, at the present time the change-over point above which rectifiers become cheaper than rotaries occurs generally a little below 1,500 volts, though naturally there are large variations in different cases. Automatic control tends to favour the rectifier, but only slightly. The rectifier occupies more space than the rotary at 600 volts, but above 1,500 volts it shows a considerable saving. In some cases special construction or location of the building, to prevent trouble due to noise, is saved. The total weight, in spite of a heavier transformer, is slightly less than for rotaries at 600 volts, and much less at higher voltages. The foundations may be lighter and simpler. The reduced cost of sub-station buildings, and the slightly simpler automatic control gear, tend to render closer spacing of sub-stations feasible, thus affording further economy in a reduction of the voltage drop in the trolley wire.

The conclusion is that the large mercury-arc rectifier, which has within the last year or two been brought to a reasonable degree of reliability, will not produce any revolutionary displacement of rotating machinery, but has a definite sphere of application within which it will be employed with advantage. That sphere is high-voltage traction. It is not at present able to invade seriously the field of power and lighting work at 400 to 500 volts; but, at 1,500 volts to a considerable extent, and at 3,000 volts predominatingly, a very large expansion of its use is to be expected.

* This paper is not concerned with the glass-bulb type, which, while excellent for small outputs up to a limit of a few hundred kilowatts, becomes hardly competitive in large sizes. The cost of bulb renewal is a serious item, the average life of bulbs being about 10,000 hours. The largest bulbs are rated at from 200 to 350 A, above which size fragility and difficulties of glass-blowing render them prohibitive.

† The possibility of developing rectifiers of lower arc drop, for example, of the hot-cathode type, may ultimately extend the field of the rectifier to lower voltages; but that development is still in the future.

Parliamentary News.

[By Our Special Parliamentary Reporter.]

The "Underground" Companies' Bill.

On February 17th, after debate, the London Electric, Metropolitan District, Central London, and City and South London Railway Companies' Bill was read a second time in the House of Commons

L.N.E.R. Electrification.

On February 18th Mr. THOMAS informed Sir Kenyon Vaughan-Morgan and Sir George Hamilton that the London and North-Eastern Railway Company had given careful consideration to the development of its suburban traffic in the neighbourhood of Liverpool Street. The company stated that a scheme of electrification had been prepared, but that in its view no such scheme would be adequate to the satisfactory solution of the problem unless provision was also made for a tube for the conveyance of the bulk of the suburban traffic between Liverpool Street and Ilford. The railway company was at present in communication with a well-known firm of engineers with a view to the preparation of a plan and estimates for a line of this description. When those plans had been received it would be open to the company to make application for assistance to the Development (Loan Guarantees and Grants) Committee.

Electrical Development in Norfolk.

On February 19th Mr. MORRISON informed Mr. Taylor that there were nine authorised undertakers in the county of Norfolk, four local authorities and five companies, and four had schemes of further development which had been under consideration by the Electricity Commissioners. The position in each case was as follows:—The Corporation of Yarmouth's Special Order had been approved by the House that morning; the King's Lynn Corporation had a Special Order which was now before him for confirmation; the Corporation of Norwich had a Special Order which would shortly be submitted to him for confirmation; and the East Anglian Company had a scheme of development for the whole of its area under the Act of 1927, including proposals in the County of Norfolk.

This scheme had now been approved by the Electricity Commissioners.

Mr. TAYLOR then asked if the Electricity Commissioners were taking any steps to expedite the provision of facilities for, and the development of, electricity schemes in Norfolk.

Mr. MORRISON said that the Electricity Commissioners were at present engaged in preparing a regional scheme for Eastern England covering the counties of Norfolk and Suffolk, and expected to be in a position to transmit the scheme to the Central Electricity Board in the course of a few weeks.

The Central Board Chairman.

On February 19th Mr. KELLY asked the Minister of Transport if, in the appointment of the chairman of the Central Electricity Board, a condition was made that he should devote his whole time to the work. Mr. MORRISON replied in the affirmative.

The Charing Cross Bridge Bill.

On February 19th the London County Council (Charing Cross Bridge) Bill was read a second time in the House of Commons by 230 votes to 62. Sir Walter Greaves-Lord, during the debate, mentioned that the Underground Railways were prepared to reconstruct their Waterloo stations so that there should be direct access from the new Charing Cross station that was to be built to both the Bakerloo tube and the Hampstead tube, which passed practically underneath the line of the station. Another tube, a very short length of considerable importance, which ran down from Holborn to Aldwych, was built at a low level with the intention of some day carrying it across the river, and it would be comparatively easy to carry that tube through to a site underneath the new station. Hence they would have easy access to the Bakerloo Tube, the Hampstead Tube, and the tube which went up to Holborn, and gave access to every part of London.

The Electricity Commission.

On February 20th Mr. HOPKIN asked the Minister of Transport if there was a vacancy on the Electricity Commission, and, if so, when appointing a commissioner, would he give special attention to the claims of an applicant who had had experience in rural areas.

Mr. MORRISON said at present there was no vacancy on the Electricity Commission nor, apart from any unforeseen circumstances, was it anticipated that any further appointment would be required. In any case, he did not think that the Commission would be suitably constituted by the appointment of members representing special interests, however important, but a technical officer was appointed to the staff of the Commission last year to deal particularly with questions of development in rural areas.

The Budget.

Mr. SNOWDEN, Chancellor of the Exchequer, informed the House of Commons on February 20th that he intended to introduce his Budget on April 14th.

Legal.

Oxford Corporation v. Oxford Electric Co., Ltd.

THIS case, which arose from the Oxford Corporation's having given notice of its intention to purchase part of the company's undertaking, was again mentioned to Mr. Justice Bennett in the Chancery Division on February 21st. The parties had been unable to agree on the method of ascertaining the purchase price, and judgment had been given in favour of the Corporation.

Mr. TYLDESLEY JONES, K.C., for the plaintiffs, now stated that the parties had agreed that the questions to be settled should be referred to a special referee, Sir William Plender.

Mr. CRAIG HENDERSON, K.C., for the company, asked that they should be given an opportunity of considering whether there was any definite factor to be added to the terms of the declaration. The defendants' financial advisers stated that before they were called upon to state the factors for consideration they would require financial details of the undertaking which were not yet available, and it was their experience that in an inquiry of this kind there emerged factors which might become of vital importance but which could not be foreseen at the outset. He suggested that the proper order was that declaration "B" should be deleted and there should be an inquiry as to the amount of the purchase price of the undertaking. If the declaration could not be omitted, it ought to include the words "and such other factors and circumstances as are material to the case."

Mr. TYLDESLEY JONES, K.C., said he did not desire to exclude anything that ought to be considered, but he asked the Judge to make the two declarations as they stood.

The Judge said that the order must stand, as the defendants had been given an opportunity of suggesting a specific addition, and they had been unable to do so.

Mr. CRAIG HENDERSON applied for a stay of proceedings on the order pending an appeal to the Court of Appeal as to the interpretation of the section of the Order.

The Judge granted a stay for a week on the condition that notice of appeal was given in that time, and, if the appeal was set down with an undertaking to prosecute it, a stay pending the hearing of the appeal.

Correspondence.

Correspondents should forward their communications as early as possible. *No letter can be published unless we have the writer's name and address in our possession.*

The Efficiency of Conversion.

I have lately been brought forcibly up against the question of conversion losses from high-pressure a.c. to low-pressure d.c. It has been difficult to obtain any information as to what the losses actually amount to, as supply authorities usually put in meters on the high-voltage side only of rotary convertors and transformers, and make a practice of charging for high-voltage a.c. units, the consumer having to bear the losses of conversion, of the existence of which, in the majority of cases, he has little or no knowledge.

There is little doubt that it can be demonstrated that the combined losses of a rotary convertor and transformer should not be very great—even at half load they would probably give a combined figure of 10 per cent. on test; but in cases that I have met with the actual loss in service is double this.

At one installation where there is over 1,000 kW of plant installed, operating on a running load factor of about 90 per cent., the loss is 20 per cent., although the meters have been carefully checked. In another case of a moderate-sized installation the loss is stated to be 22 per cent. In money value this works out to about £3,000 per annum.

Is it possible that the excitation loss during periods when a transformer is standing for two shifts out of three, and working only 48 hours a week, can amount to anything like 15 to 20 per cent. of the total units consumed?

The matter is one of great importance to anyone thinking of taking power from the grid, as, in addition to the capital charges he has to bear for rotary convertor, transformer, and switchgear, he apparently has to pay for a large amount of current which he never uses. If, for instance, the supply authority quotes .8d. per kWh, and the efficiency of conversion is only 80 per cent. at a normal load factor of, say, 80 per cent., the price he is really paying is .8×100/80, or 1d. per useful kWh. In addition there may be periods during the night or week-end when only a small amount of current is taken. The efficiency will then be much lower, and the cost of current proportionately higher.

If any readers could quote actual cases, with particulars of the incoming and outgoing current, I should be much obliged. Theoretical estimates are not wanted.

Weoley.

February 18th, 1930.

I shall be interested to have the unbiased opinion of your readers on the respective and relative merits of the following methods of converting a.c. into d.c. for the charging of radio and motor car batteries:—

(1) Motor-generator sets, such as Crypto, Akk-Emmar, &c.
(2) Valve rectifier sets, such as Philips, Davenset, &c.
(3) Metal rectifiers of the Westinghouse type.

The load varies from 150-250 cells per week, four rates of charge, on cascade system.

Also has the constant-potential system any advantages over the constant-current system as regards general efficiency, safety, and economy?

D. T. J.

February 22nd, 1930.

Motor Users and the Frequency Change.

Referring to the letter from Messrs. Crompton Parkinson, Ltd., which appears in your current issue, although the following points do not affect change-over customers as such, they may conceivably affect them later on and should be of some interest to other "motor users." Will Mr. Windibank tell us what becomes of the 25-cycle machines which are removed at the change-over?

(1) Are they scrapped?
(2) Are they re-wound for 50 cycles and sold as partly second-hand?
(3) Are they re-wound and sold as new, in spite of the fact that all mechanical parts and cores have already been in use for a considerable time?

H.

February 22nd, 1930.

Accumulator Charging.

May I add weight to the letter of Mr. E. A. Geoch *re* accumulator charging which appeared in your issue of February 21st?

I have a 12-V, 30-amp. (actual) battery for which I am charged 3s. 6d. per charge. Considering that the actual energy used in charging does not exceed 450 Wh, and that a unit costs about 6d., this price is rather high, allowing the charging rectifier the low efficiency of 50 per cent. A recharge, including topping, &c., ought not surely to exceed 9d.

Amateur.

February 22nd, 1930.

Published Specifications.

Compiled expressly for this journal by a firm of Chartered Patent Agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings taken.

1928.

3,341. "Amplification of signals in the reception of quadruplex telegraphy." Creed & Co., Ltd., E. A. Willson, H. F. Woodman, and E. Greig. November 2nd, 1928. (324,678.)

17,126. "Automatic wireless distress signal and position indicator." J. G. Cuthbert (N. Richardson). March 8th, 1929. (324,422.)

24,399. "Apparatus for producing high-frequency alternating currents by means of spark-gaps." J. E. Scheel and W. H. Bull. August 24th, 1927. (296,067.)

25,095. "Insulated conductors." E. A. White (Rockbestos Products Corporation). August 31st, 1928. (324,684.)

27,899. "Electric wiring devices." Edison Swan Electric Co., Ltd., and S. Rogers. September 28th, 1928. (324,619.)

27,973. "Electric motors." W. C. Fairweather (Underwood Elliot Fisher Co.). September 29th, 1928. (324,652.)

28,102. "Construction of electrolytic cells." P. Pestalozza. October 1st, 1928. (324,689.)

30,865. "Electric switch for controlling signalling apparatus." A. P. Mill. October 24th, 1928. (324,634.)

30,951. "Incandescent cathode for discharge tubes." Dr. W. Germershausen. October 26th, 1927. (299,431.)

31,092. "Electro-magnetic pick-ups for use with gramophones and the like." C. Berrage-Moulton. October 26th, 1928. (324,636.)

31,103. "Thermionic valves." Loewe Audion Ges. October 27th, 1927. (299,469.)

31,154. "Radio and the like receiving apparatus." J. L. Pivert. October 27th, 1927. (299,474.)

31,156. "Two-way electrical signalling systems." Standard Telephones and Cables, Ltd. (Western Electric Co., Inc.). October 26th, 1928. (324,639.)

31,268. "System of electric signalling for automatically insuring safety in rail-road traffic." A. Tasquin and R. Belfosse (*née* Foy). October 29th, 1927. (299,712.)

31,320. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd., C. Gillings, and T. G. Rice October 29th, 1928. (324,642.)

31,331. "Thermionic discharge devices." M-O Valve Co., Ltd., and C. W. Cosgrove. October 29th, 1928. (324 653.)

31,344. "Electrically-heated furnaces." Siemens-Schuckertwerke Akt. Ges. December 12th, 1927. (302,223.)

31,441. "Electric discharge devices for producing a photographic record of fluctuations in current." F. A. Lindeman. October 30th, 1928. (324,696.)

31,517. "Reproduction of sound in association with picture projection." R. Von Koch. October 30th, 1928. (324,697.)

31,524. "Telephonic microphones and gramophonic microphone appliances, electrical pick-ups, and the like." S. Cauthery, S. C. Winfield-Smith, and Burovox, Ltd. October 30th, 1928. (324,698.)

31,619. "Electrical batteries." Anglo-American Chemical Co., Ltd., and C. M. Gourvish. October 31st, 1926. (324,666.)

31,647. "Signalling systems." Electrical Research Products, Inc. December 17th, 1928. (302,571.)

31,710. "Automatic or semi-automatic telephone systems." Standard Telephones and Cables, Ltd. (Western Electric Co., Inc.). October 31st, 1928. (324,675.)

31,711. "Selecting switches of the kind used in automatic telephone systems." Standard Telephones and Cables, Ltd. (O. Bracke). October 31st, 1928. (324,676.)

31,772. "Solenoids and electromagnets." Penrose Lifts, Ltd., and W. H. Sweet. November 1st, 1928. (324,703.)

31,783. "Wireless receiving systems and apparatus." H. E. Cox. November 1st, 1928. (324,704.)

31,803. "Electric insulators. A. O. Austin. November 1st, 1928. (324,706.)

31,808. "Insulating means for high-tension conductors associated with electric switches." Conduit Electrical Manufacturing Corporation. December 31st, 1927. (303,350.)

31,857. "Arc-discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. November 30th, 1927. (301,455.)

31,961. "Synchronous telegraph systems" Electrical Research Products, Inc. January 5th 1928. (303,499.)

31,970. "Fans or blowers." N. F. T. Saunders and Associated Electrical Industries Ltd. November 2nd. 1928. (324,714.)

31,992. "Electric lamp fittings or shades." S. W. Hamlyn and L. Dernier and Hamlyn, Ltd November 2nd, 1928. (324,715.)

32,067. "Controlling apparatus for electric circuit breakers." A. Reyrolle and Co., Ltd., F. Coates, and R. Anderson. November 3rd, 1928. (324,730.)

32,076. "Radio-receiving and transmitting apparatus." H. W. Adey. November 3rd, 1928. (324,721.)

32,429. "Impulse-sending arrangements for use in telephone systems or the like." Automatic Telephone Manufacturing Co., Ltd., and S. R. Smith. November 6th, 1928. (324,728

33,783. "Electric cables." P. D. Morgan, S. Whitehead, E. B. Wedmore, and British Electrical and Allied Industries Research Association. November 17th, 1928. (324,740.)

34,235. "Machines for wrapping bobbin electrodes of electric batteries." A. E. White (Abingdon Engineering Co., Inc.). November 21st, 1928. (324,746.)

34,533. "Insulators." K. A. Hawley November 23rd, 1927. (301,046.)

35,886. "Dynamo-electric machines." British Thomson-Houston Co., Ltd., and A. A. Pollock. December 5th, 1928. (324,753.)

36,206. "Method of, and apparatus for, selectively discharging liquids according to their electric conductivity, particularly applicable for selecting pure water from water of condensation and returning it to boilers." Papeteries Navarre. February 1st, 1928. (305,163.)

36,422. "High-voltage electrical switches." Akt. Ges Brown, Boveri et Cie. December 15th, 1927 (302,355.)

36,871. "Thermionic limiting, amplifying and the like devices." S. B. Smith. December 13th, 1928. (324,766.)

37,242. "Electric motor control systems." General Electric Co., Ltd., and E. H. Croft. December 17th, 1928. (324,770.)

37,618. "Sealing devices for use with electric cables and other apparatus." British Insulated Cables, Ltd., and J. N. Cresswell. December 20th, 1928. (324,773.)

37,923. "Selecting switches as used in automatic telephone and like selective systems." Siemens Bros & Co., Ltd., and H. E. Humphries. December 22nd, 1928. (324,776.)

1929.

477. "Wireless valve holders or holder adapters" W. O. Heyne and Plessey Co., Ltd. January 5th, 1929. (324,788.)

702. "Electrical induction furnaces." N. R. Davis and Associated Electrical Industries, Ltd. January 8th, 1929. (324,789.)

1,540. "Synchronous transmission of movements." C. Lorenz Akt. Ges. January 17th, 1928. (304,240.)

2,012. "Methods of exhausting electric discharge devices." British Thomson-Houston Co, Ltd. January 21st, 1928. (304,604.)

3,760. "Wireless transmitting and receiving apparatus." G. C. D. Pfau. February 2nd, 1928. (305,486.)

4,282. "Electric multi-conductor cable." H. Sonnenfeld. December 6th, 1928. (Addition to 273,167.) (324,822.)

4,865. "Thermionic valves." Telefunken Ges. für Drahtlose Telegraphie. March 3rd, 1928. (307,058.)

5,043. "Traffic-regulating station with advertising signs." L. Mellersh-Jackson (Siemens & Halske Akt. Ges.). February 14th, 1929. (324,828.)

5,939. "Thermostatic electric switches." General Electric Co., Ltd., C. W. Stopford, and H. M. S. Hunt. February 22nd, 1929. (324,832.)

6,043. "Piezo-electric crystal apparatus." Federal Telegraph Co. February 25th, 1928. (306,829.)

6,218. "Mercury-vapour discharge devices." Gramophone Co., Ltd., A. Whitaker, and C. O. Browne. February 25th, 1929. (324,835.)

7,905. "Load-regulating systems in electric installations." Telefonaktiebolaget L. M. Ericsson. March 14th, 1928. (307,833.)

8,064. "Arrangement for the smooth coupling in correct phase of rotating parts." Siemens & Halske Akt. Ges. March 14th, 1928. (307,836.)

8,610. "Thermionic valves or electron discharge tubes." Mullard Radio Valve Co., Ltd., and C. R. G. Waite. March 16th, 1929. (324,846.)

9,258. "Inductances." J. H. Reyner. March 22nd, 1929. (324,849.)

11,763. "Current transformers." International General Electric Co., Inc. April 17th, 1928. (309,918.)

12,623. "Electric motors." A. J. Stephens (Excelsiorwerk Metallwarenfabrik Akt. Ges.). April 23rd, 1929. (324,868.)

13,611. "Induction furnaces heated by high-frequency coils." Heraeus Vacuumschmelze Akt. Ges. and Dr. W. Rohn. May 1st, 1929. (324,869.)

14,690. "Means for regulating the output voltage of vapour electric rectifiers." British Thomson-Houston Co., Ltd. May 10th, 1928. (311,388.)

15,088. "Apparatus for the telephonic delivery of audible indications in public conveyances." Siemens & Halske Akt. Ges. September 11th, 1928. (318,886.)

15,969. "Electrical condensers." E. Haefely et Cie. Akt. Ges. June 16th, 1928. (313,600.

17,463. "Control of electric motors and generators." J. E. Allan. August 24th, 1928. (Cognate application 17,464/29.) (Divided application on 316,111.) (324,629.)

23,578. "Operating devices for trailable track points." Telefonaktiebolaget L. M. Ericsson. August 4th, 1928. (316,879.)

25,956. "Radio and like apparatus." Igranic Electric Co., Ltd., and D. Sinclair. April 22nd, 1929. (Divided application on 319,418.) (324,889.)

Trade Mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from February 19th :—

Regina (lettering and design). No. 506,447. Class 6. Vacuum cleaning and floor-cleaning machines and parts thereof.—Regina Corporation, Rahway, N.J., U.S.A. (British representatives: White, Langner, Stevens, Parry and Rollison, 5-9, Quality Court, Chancery Lane, W.C.2.)

Emkabe No. 506,793. Class 8. Instruments, apparatus, and parts thereof for use in radio-telegraphy and telephony.—Emkabe Radio Co., Ltd., 47, Farringdon Road, E.C.1.

J. L. Baird (name signature). No. 507,690. Class 8. Apparatus for use in transmitting views, scenes, or images to a distance by telegraphy.—Baird Television Development Co., Ltd., 133, Long Acre. W.C.2.

Tencelite. No. 508,553. All goods in Class 8. except electric cables.—Berry, Wiggins & Co., Ltd., Water Lane, Stratford, E.15.

Cutax. No. 508,623. Class 13. Electric switches and circuit breakers.—Dr. Paul Meyer Gesellschaft, Berlin. (British representatives: H. A. Gill and Co., 51-52, Chancery Lane, W.C.2.)

Apollo. No. 508,828. Class 18. Electric fires and radiators.—W. P. Eglin, Ltd., Victoria Street, Sowerby Bridge, Yorks.

Electricity on the Poultry Farm.

A very interesting electric steam boiler installation has just been completed in what is believed to be the world's largest poultry farm, at Corstorphine, Edinburgh (see ELECTRICAL REVIEW, August 17th, 1928, p. 292). Its size may be gauged from the fact that as many as 170,000 eggs (all white leghorns) are hatched and the pullets reared up to six weeks of age in a mammoth incubator and brooder at one time. The chickens when hatched are placed in scientifically arranged brooders and kept from that time to six weeks old in a carefully regulated temperature, which is decreased as the chickens grow up. Steam heating is essential for this delicate work; in fact, it is claimed to be the only way of obtaining the exact conditions which must be maintained in the various brooders. The complete system of steam supply has been arranged by Commander Campbell Allen, of Messrs. Bastian & Allen, the whole installation being arranged to give entirely automatic working under all conditions. Three "Mascarini" boilers loaded up to 900 kW, 400 volt, 3 phase, working in conjunction with a Ruths steam storage system, supply the necessary steam to the mammoth brooders. No doubt from an electrical standpoint the greatest interest is in the very satisfactory working of the "Mascarini" boilers.

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

ACOMB.—New Ainsty Hotel, for J. J. Hunt, Ltd., York.

BARNSLEY.—Hotel, Kendray housing estate, for the Barnsley Brewery Co., Ltd.

BEDFORD.—Houses (132), Corporation estate (£45,540); C. A. White. School extensions (£50,000); G. P. Allen, school architect.

BIRMINGHAM.—Cinema, Chester Road and Gravelly Lane (£40,000); H. Scott, architect, 117, Colmore Row. Factory premises, Tyburn Road, Erdington, for W. H. Briscoe, Ltd., 51, Par Street; Ewan Harper, Brother and Co., architects, 191, Corporation Street.

BOSTON.—Additional 112 houses, for the T.C.; borough surveyor.

BRISTOL.—Junior school (400 places), St. Anne's housing estate; Lessel McKenzie, architect, 63, Queen's Square. Y.M.C.A. headquarters (£30,000); secretary, Colston Street.

CANNOCK.—Housing scheme (34), for the U.D.C.; surveyor.

CASTLEFORD.—Elementary school (800 places); H. Wormald, architect, County Hall, Wakefield.

CATHCART.—Bungalows (34) in Menock Road and Kingsbridge Drive; Mactaggart & Mickle, Ltd., builders, 65, Bath Street, Glasgow.

CHEETHAM.—Factory, Waterloo Road; Drury & Gomersall, architects, 21-22, Imperial Buildings, 15, Oxford Street, Manchester.

CHESTER.—Extensions, county offices, Chester Castle; county architect.

CHINGFORD.—Houses (40), public hall and baths, for the U.D.C.; surveyor.

CLAYTON.—Carlton Cinema, Ashton New Road and Crabtree Lane; Peter Cummings, architect, 51, King Street, Manchester.

CLYDEBANK.—High school; executive officer, Dumbartonshire Education Authority.

COLCHESTER.—Cinema theatre, Crouch Street; David Ager.

DORCHESTER.—Municipal buildings; borough engineer.

DUNFERMLINE.—Housing scheme (80), Kelty; clerk to the Dunfermline District Committee. High school (£97,382); J. C. Cunningham, architect, 1, Gregory Place, St. Andrews.

EDINBURGH.—Extensions, Newhaven schools, with heating and lighting work (£9,550), for the E.C.; director of education.

ESTON.—Housing scheme (100), Grangetown, for the U.D.C.; surveyor.

FALMOUTH.—Additions to Madeira Hotel, Clifford Road, and new shop premises, Polwhaveral Terrace; Strongman and Sons, builders, Joinery Works.

GRIMSBY.—Maternity home, Nunsthorpe (£17,540); borough engineer.

HADDINGTON.—Extension of county buildings (£15,000); county clerk.

HAMILTON.—Employment exchange; architect, H.M. Office of Works, 122, George Street, Edinburgh.

HANWELL.—Admission villa, Mental Hospital (£37,873); W. H. Gaze & Sons, Ltd., Kingston.

HARROGATE.—Extension of infirmary (£50,000); secretary to the Board. Depôt, for T.C. (£41,000); borough engineer, Municipal Offices. Adaptation of Victoria Baths to municipal offices (£35,000); borough engineer.

HASTINGS.—Additional housing scheme (168), Hollington, for the T.C.; borough surveyor. Houses (130), St. Mary's estate, for Bexleigh Estates, Ltd.; H. H. Ford, architect. Houses (22), Elphinstone Avenue; H. M. Jeffery, architect, 1b, Havelock Road.

HEREFORD.—Housing scheme (300), for the T.C.; city surveyor.

HORDEN COLLIERY.—Pithead baths, with electrical work (£30,000); William Hall & Co., builders, Gateshead.

HORNCHURCH.—Houses (69), Staverton Road and Hill View Avenue, for Standen Bros. Houses (47), Burn Way, for Bint & Clark.

HUTTON.—Extensions, Grammar School (£32,000); Lancs. E.C.

IRISH FREE STATE (CARLOW).—Houses (40), for U.D.C.; Manning Robertson, architect, 3 and 4, College Street, Dublin (returnable deposit of £3).

(MONAGHAN).—Houses (20), old workhouse grounds site, for the U.D.C.; J. McDonald, town clerk (returnable deposit of £2 2s.).

(TALLAGHT, Co. DUBLIN).—School; clerk to the Council.

KINGSTON-ON-THAMES.—Tiffin Girls' School (£45,000), for Surrey E.C.; W. W. Finny, secretary, Kingston-on-Thames.

LEEDS.—Rebuilding Crown Hotel; Garside & Pennington, architects, Ropergate, Pontefract.

LONDON (BARKING, E.).—Extensions, Gascoigne School (£11,561), for the E.C.; education architect.

(E.C.).—Premises for *Daily Express*, Fleet Street and Shoe Lane; Sir E. Owen Williams.

(SOUTHWARK, S.E.).—Clearance scheme, Moss Alley area, and rehousing, Bridge House estate; City of London engineer.

(BERMONDSEY, S.E.).—Rehousing scheme, Odessa Street; borough engineer. Clinic, Tower Bridge Road (£94,000); G. Corderoy & Co., quantity surveyors. Library, Jacob Street; B.C. works manager.

(WESTMINSTER, S.W.).—Hotel on Dorchester House site; Sir Owen Williams.

(WIMBLEDON, S.W.).—Boys' secondary school, Raynes Park, for Surrey E.C.; W. W. Finny, secretary, Kingston-on-Thames.

(EALING, W.).—Houses (228), Whitton, Ennismore, and Sherwood Avenues, for Walton Heath Land Co.; Richard Costain & Sons, architects, Fitzalan House, Arundel Street, W.C.2. Houses (83), Whitton Avenue, Wellgarth and Ashness Gardens; John Laing & Sons, Ltd., "Parklands," Mill Hill, N.W.7. Houses (65), Mansell Road and Ellesmere Road, for G. Wimpey and Co., Ltd.; H. S. Bostock, architect, Broadway Chambers, Southall.

(HAMMERSMITH, W.).—Central depôt, Crisp Road (£51,000); borough engineer.

LOWESTOFT.—Senior girls' school, Church Road, for the E.C.

LUTON.—Employment exchange, for H.M. Office of Works, King Charles Street, London, S.W. (returnable deposit of £1 1s.).

MALDEN.—Central school (£19,448), for Surrey E.C.; Chapman, Lowry & Puttick, builders.

MALVERN.—County Hotel (£60,000), for Lady Constance Mary Honywood.

MANCHESTER.—Refuse disposal plant at Mount Road cleansing depôt, Gorton; city architect, Town Hall (deposit £1 1s.).

MEXBOROUGH.—Houses (56); G. E. Carter, Council Offices.

MILDENHALL.—Housing scheme (88), for the R.D.C.; surveyor.

NEWTON HEATH.—Factory, Rothwell Street, for Sivovi Bros.; Roland Thomasson, architect, 87, Mosley Street, Manchester.

OXFORD.—Baths, Cowley Road; city engineer.

PENRITH.—Development of Croft House estate; Lords Estate Co., Ltd., Oldham.

POULTON-LE-FYLDE.—Senior school; new premises, for Poulton Baines Grammar School (£26,000); Lancs. E.C.

ROTHERHAM.—Premises, for Montague Burton, Ltd.; H. Wilson, architect, 81, North Lane, Roundhay.

SITTINGBOURNE.—Two schools (1,600 places), for Kent E.C.; E. Salter Davies, director of education, Maidstone.

SPALDING.—Re-erection of stores, for Messrs. Westcombe (£15,000).

STOCKPORT.—Additional housing scheme (238), South Reddish, for the T.C.; borough surveyor.

STRATFORD-ON-AVON.—Cinema theatre and shops, Wood Street, for S. M. Davis.

SUNDERLAND.—Reconstruction of administrative block, Royal Infirmary (£36,000), for Board of Management.

TAMWORTH.—Hotel, Mile Oak housing estate, for James Eadie, Ltd., Burton-on-Trent.

TITCHFIELD.—School (300 places); Hampshire E.C.

TROWBRIDGE.—Girls' secondary school, for Wilts. E.C.; T. Walker, county architect.

WARRINGTON.—Bakery, Winwick Road, for Warrington Co-operative Society; Woof, Cronshaw & Sons, Ltd., contractors, Pump Street, Blackburn.

WELLINGBOROUGH.—Public hall and baths (£25,000), for the U.D.C.; surveyor.

WESTON-SUPER-MARE.—Concert pavilion and shelters (£10,000), for the U.D.C.; H. A. Brown, surveyor.

WINCHESTER.—Houses (132), Milland Road, for the T.C.; city engineer.

WINSLOW (BUCKS.).—Electric lighting installation at Institution, for the Board of Guardians; clerk.

WORSBOROUGH.—Houses (48), Ward Green, for the U.D.C.; T. Shield, architect, Saville House, Worsborough Bridge.